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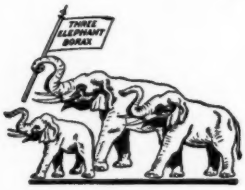

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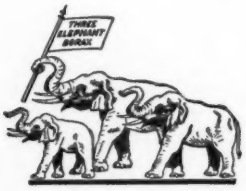

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

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"THAT'S WHERE THE TALL CORN GROWS"—IN IOWA, AND MANY OTHER STATES.

Better Crops with PLANT FOOD

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Let's Listen to Rural—

Post-War Prophets

Jeff McDermid

OUTLINING an "agenda" for an official conference on post-war agriculture is something like writing a timetable for a railroad line before they have even surveyed the right of way or bought the rolling stock. It's even more of a jigsaw puzzle when there are no farmers on hand to put in objections or make potent suggestions, like the recent Milwaukee six-day marathon of outlook specialists. Most of the farm folks who must do the performing on post-war production have been too tired to keep up with the war news except what they get, two months old and censored to smithereens, from sons in fox-holes.

But one does sometimes find a retired farmer or an indigent one who has escaped the old man's habit of looking backward, because the war and his absent relatives combine to induce his imagination to peer ahead. From these grizzled prophets and from a few strong-minded women who think long thoughts over their canning, it is possible to glean a patchwork of pieces worthy of being sewn together as a sort of crazy quilt to cover a multitude of weary but hopeful dreamers.

Perchance, the quilting bees we have visioned as soon to busy themselves cutting and tying the fabric of a farm-minded peace world may be premature. If the Italian campaign augurs well for August peace in 1944, these plans may be well timed and none too soon. But if Hitler and his hordes put up a long and costly struggle, the strength and energy of our farm folks will be taxed beyond the point where calm and reasonable plans can be threshed and winnowed effectively.

To meet this contingency, it should be arranged to give our winter-bound rural brethren every chance to pick apart all proposals during the ensuing dormant equinox. It is both unwise and unfair to hatch out a batch of post-war broilers in Washington and not let the real producers have a hand in culling them and fitting them for a useful, crowing, wing-flapping career.

Moreover, as any of my aforesaid farm mentors will tell you sagely, the farmers of today are aware and awake to the fact that agriculture is not the only segment of society to be affected by the coming turmoil of peace—in spite of what some leaders would have the public understand.

Agriculture does not intend hereafter to live in any air-tight, reserved section of society, with old labels and shabby shibboleths to identify farmers as peculiarly prejudiced or insulated isolationists.

WHEN their sons went into the army, nobody catalogued them as farmers, but they joined up as any citizen would with all the privileges and obligations common to Americans at war. Of course, there are bound to be certain impacts of a post-war economy which will be felt strongly by agriculture, but you are not going to lead farmers into a post-war discussion by jauntily placing a chip on the shoulder of Ceres, for somebody to knock off at their peril. Trouble shooters and trouble makers are quite different things, and farmers won't stand for the latter when peace comes. Hell-raising is no novelty with farmers, but it's getting to be a bit of a bore, especially the internal kind.

On the other hand, being human and jealous of their craft, the farmers are not likely to be taken in much by any post-war outline which is too easy, smug, and rosy. Their long, uncanny experience with dealing and double-dealings in the open market and in legislative forums have taught them to be gun-shy of any cure-alls.

In this sense, I recall the way one good farmer explained his attitude toward extreme oversimplicity in making generalties on future trends and post-war problems.

"When we were kids tramping down the road, we would mention with glee some convenient ripe watermelon patch a mile or so ahead of us. We would divide the work and risk between us, appoint sentries to watch out for the owner, and agree to share and share alike on the juiciest hearts of the reddest specimens."

Then he would take a long breath and smile sagely. "But it didn't usually turn out that way. Under the impetus of greed and appetite, forgetful of each other and the owner, we would rush in and rip and tear, swipe and run."

I believe that sums up the over-zealous attempts to plan unforeseen developments on the basis of what may be dignified and deliberate courses to pursue.

"No, we don't expect human nature to be dry-cleaned of its stinking propensities just because the war was long and costly and glorious goals were talked about," continued the farmer. "But be darn sure we are going to try and make them play the game with decent rules and give everybody a fair shake just the same."

One rural leader said it this way: "We've got to be careful to hew a neat line in between the starry-eyed ideas that look cockeyed to go-getters and the ruthless methods of financial pirates. Many of our farm folks sneered a lot at work-relief and make-work and WPA and the dole, but they forgot or never knew, what it was like to be in the bread line or without means of supporting the family. I'm afraid some of us will have to revise our ideas and ideals considerably on that score, so that we can move ahead together."

Just about here in the argument, some rural worker is apt to trot out the bogey of what share we are to play in the feeding and revitalizing of the conquered countries of Europe and

Asia. In the beginnings of lend-lease food export, we had many rural opponents and skeptics, but now that talk of stomach salvation for hosts of starving victims of war-torn lands is added to the burden, we find plenty of adverse comment again.

"When we go into conquered areas and proclaim our intention to feed and clothe and finance things, we are biting off a bigger hunk than we can chew—until the farm boys get back into the furrows again," remarked one critic.

"By persisting in a doctrine of that kind, we are sure to cause a lot of disappointment even before the war ends. What would be sounder is a program to establish order and educate and train the natives so they can rebuild their own production."

But away back in the minds of many arises the picture of the kind of world-trade philosophy we are supposed to build up after peace comes. Here is one of the toughest nuts to crack when you sit around a table with high-tariff habitues. Our Midwest has been so far removed from the seaboard economy and so much inclined to resent the encroachments of foreign competition in livestock, grain, and dairy products, that it seems likely to inflame some of the familiar old debaters sooner or later.

ANY way you look at the future of trade between nations, the signs point to a renewal of reciprocal treaties on our part, and the desire of foreigners to ship us raw materials," one farmer thinks. "Trade barriers and high customs were the chief reason for depressions everywhere, and unless we abandon some of our traditional tub-thumping tactics to incite each region and locality and branch of agriculture to protect its pet product from threats of outside competition, we will be right back where we started."

During the flush of war booms when it's all export and hardly any import, it's relatively easy to adopt a world-wide, international, almost a free-trade spirit, these observers think. But once the drift starts in the other direction and Congress hears from the leather-lunged lobby, lots of us will become locoed again on local issues. Pressure groups will be organizing to keep foreign products from our shores, even after we spent good tax money helping to put them back on their feet.

"Manufacturers, too, will be obliged to find employment for hosts of returning warriors, and they are going to be jealous of their share of the home market," points out another farmer. "This world-trade thing is going to be a major issue, and we'll be facing a stern necessity, not a dreamy theory. Its proper solution will affect farmers just as much as wage earners."

Therefore, one thing American agriculture needs now is a solid committee of its membership divorced from party or society to study international trade and help to avoid any stampede or mob scenes when the critical time arrives, the time of making a national decision on the way we are going in fitting free-trade into the four freedoms.

"And the next committee we need, brother," pipes in one of our best farm friends, "is a set of tough buzzards who will be willing to risk a few scars and bruises wrangling with a similar body of union leaders about post-war relations of farm and factory."

"You've said a mouthful, but it's more than we can chaw easily at one meal," answers the second farmer. "Heaps of fancy economists have spent months dredging out that old slough of despond, and they ain't got any clear water yet."

(*Turn to page* 51)

This photograph on the farm of Dr. J. L. Brock near Franklinton, La., contrasts improved and native pastures. When this picture was taken (April 16, 1943) 25 cows, 6 yearlings, and 11 calves were grazing the 4-acre pasture seen at the left. These 42 animals had been alternated between this and one other 4-acre pasture between December 20, 1942, and the date the picture was made.

Pastures— *That Come to Stay*

By Charles G. Webb
Soil Conservation Service, Fort Worth, Texas

WITH potash, lime, superphosphate, organic matter, and the right combination of clovers and Dallis grass, soil conservation district cooperators in Louisiana's Florida Parishes are building some of the world's finest pastures to produce greatly increased amounts of milk and beef with which to help fight a war.

Idle land, eroded land, and land grown weary with decades of cotton production have been converted into grazing lands worth $50 to $75 per acre each year in increased milk production and reduced feed costs. In the past three years, soil conservation district cooperators, in putting complete soil conservation systems on all their lands, have established these improved pastures on 4,000 acres, and more than 10,000 additional acres are going to clovers and grass this fall. This progress has been in part responsible for an increase of more than 20 per cent in the milk production of the New Orleans-Baton Rouge milkshed in the past year. Milk is high on the list of the war foods.

What is happening in the Florida Parishes of Louisiana is applicable to a large part of the Old Cotton South. Grassland agriculture will have an important role in the making of a New South, healing and making profitable millions of erosion-torn acres. Pasture improvement, of course, is only one phase of a soil conservation program

which isn't complete until every acre is protected.

Driving force behind this amazing pasture development program is W. E. Dee—Bill Dee to the farmers of Bogue Chitto-Pearl River and Feliciana Soil Conservation Districts that cover practically all land subject to soil erosion in Louisiana east of the Mississippi River.

Agronomist by training, experience, and preference, Bill Dee is a district conservationist assigned by the Department of Agriculture Soil Conservation Service to serve these two soil conservation districts. Good pastures are both vocation and avocation with Dee. He hired out to the Soil Conservation Service for six eight-hour days a week, but he comes nearer to spending 16 hours a day, seven days a week on the job. Many's the Sunday he has spent helping dairymen plan or establish pastures.

Dee keeps voluminous notes on pasture treatment and results, and he reads every book—old and new—that he can find on the subjects of agronomy and soil conservation. His collection of yearbooks on agriculture dates back to the first one issued in the United States, by the U. S. Patent Office in 1837, and there are missing from his shelves only eight of the yearbooks of agriculture published since by the Patent Office and the U. S. Department of Agriculture.

Of course, Bill Dee has had help in the pasture program. Soil Conservation Service technicians at St. Francisville and Clinton in the Feliciana Soil Conservation District and at Kentwood and Franklinton in the Bogue Chitto-Pearl River Soil Conservation District have learned to plan and establish pastures as well as they can carry out other phases of the coordinated conservation program. Soil fertility tests are essential. These are made by the Soil Testing Laboratory of the Louisiana Agriculture Experiment Station, at Louisiana State University. County Agents take the lead in the educational program. Vocational agriculture teachers help. The Dairy Farmers Protective League vigorously backs the pasture improvement program. Every farmer who has one of these good pastures becomes a salesman.

Slice a cross-section of the people in the soil conservation districts and you'll

Six cows had grazed this 5-acre pasture on the Cutrer farm near Kentwood, La. from March 1, 1941 to April 15, 1943, when the photograph was made. At that time, the clovers had grown continuously for more than 12 months. Watching the registered Guernsey enjoy the lush clovers are J. B. Cutrer (left) and Dr. H. H. Bennett, Chief of the Department of Agriculture Soil Conservation Service, Washington, D. C.

D. H. Gill of Tangipahoa Parish (center) tells W. E. Dee (left) and Dr. Bennett that cows grazing on improved pastures produced calves that sold for an average of $17 each more than did calves of the same age from cows that grazed native and woods pastures.

find men in every occupation or profession confident that soil conservation and pasture development is the way to a more abundant life for the residents of the Florida Parishes. J. M. Breeden, the banker; Frank Crow, the barber; and Rev. W. R. Cutrer, the minister—all are pasture enthusiasts.

Banker Breeden of Greensburg observed that he became enthusiastic for Bill Dee's pasture program when farmer bank deposits from milk production began to rise and he learned that good pastures were responsible.

"Our bank can prosper only when our customers and the entire community are prosperous," Breeden said, and urged other farmers in the Greensburg trade territory to establish these pastures that cost $15 to $25 per acre to build and return this initial cost of labor and materials within 8 to 10 weeks of grazing.

Barber Crow of Franklinton dispenses praise for pasture building along with haircuts and shaves. He knows from personal experience that improved pastures pay dividends. On his farm near Franklinton he has 4.8 acres of second year clover-Dallis grass pasture and 4 acres of first year pasture. Last spring these 8.8 acres carried 13 producing and 5 "dry" dairy cows with a daily feed cost for concentrates less than 25 cents per cow for the producers.

Rev. Mr. Cutrer is minister, farmer, and a member of the Louisiana Legislature. He and his son, J. B. Cutrer, now have 59 acres of extremely fine pastures near Kentwood. In 1942 when the Cutrers turned their herd into the clovers, the daily milk production ranged from 275 to 300 pounds. After two weeks of grazing, the daily milk production ranged from 600 to 625 pounds from the same herd, with a substantial reduction in feed costs. The Cutrers significantly reported that their herd has been much healthier since the pasture development program began, a fact they attribute to the application of lime, phosphate, and potash to the land.

Visit farm after farm in the two soil conservation districts and you hear the same story of better land use and increased production and income.

B. F. Hyde of Roseland in 1943 kept records of a representative period before he placed 16 milk cows and 12 heifers in a 12-acre pasture of white, hop, and

This land was producing an average of 1½ bales of cotton per acre before it was placed in pasture in the fall of 1942 by J. M. Lambert (right). Here he tells Dr. Bennett that this land is worth more in pasture than in cotton, and that 18 dairy cows increased milk production by 16 gallons when they began grazing the pasture in the spring of 1943.

Persian clovers and Dallis grass. Average daily production was 231 pounds of milk. For the next 37 days, with the herd on the pasture, the average milk production was 344 pounds daily from the same 16 cows. The increase was 113 pounds per day, worth $4.52 to the dairyman. And he had a daily saving of $2.74 in feed costs. For this 37-day period, the pasture worth was figured at $268.62, or $22.38 per acre.

D. H. Gill of Tangipahoa Parish has 50 acres of improved pasture. Last spring Gill reported that calves from cows grazing on clover-Dallis grass pastures sold for $17 more per head than did calves of the same age from native and woods pastures.

Good pastures are encouraging farmers to purchase and breed good livestock. Lee Ezell, Franklinton dairy farmer who has 10 acres of Dallis grass and clover pasture, recently bought 10 registered Jersey cows and a registered Jersey bull.

Some good land is going to pasture, too. J. M. Lambert, who lives near Kentwood, has placed clovers and Dallis grass on four acres that formerly produced an average of one and one-half bales of cotton per acre. Lambert hired all the labor and paid cash for seed, lime, and fertilizers. Total cost was $34 per acre. On April 15 Lambert said that 18 cows were giving 16 gallons more of milk per day than they were before they began grazing the pasture. This increased production was worth about $4 a day, Lambert said. Thus the entire cost of the pasture could be repaid in 34 days.

No hit-or-miss procedures and no guess work go into the making of these lush, money-making, food-producing pastures. Methods are exact and scientific. Before any pasture is established three fundamental questions are answered: (1). What is the physical condition of the soil and what amounts of plant nutrients and organic matter does it contain; (2). What additional nutrients and organic matter are required to grow profitably the desired legumes and grasses; and (3). How many acres of pasture does the farmer need for the number of dairy or beef animals he wishes to maintain?

Soil study and analysis come first.

Standard soil conservation surveys made by Soil Conservation Service technicians, first step in all soil conservation work in the districts, answer some of the questions about the land: What is the present land use of the land? What is the soil type? What is the slope? How much soil has been lost by erosion? Carefully taken samples of topsoil and subsoil sent to the Soil Testing Laboratory of Louisiana State University Experiment Station are accompanied by detailed information regarding the past five years' use and treatment of the land: What crops have been grown, what fertilizers or lime applied, what yields obtained, whether winter or summer legumes have been grown, and with what success. Soil conservation survey data are included, too.

Laboratory tests determine the amounts of plant nutrients present in the soil and enable pasture planners to prescribe specific quantities of potash, phosphoric acid, magnesium, and lime necessary to grow successfully the legumes and grasses wanted on the land where the samples were taken. A report on the percentage of organic matter content of the soil serves as a guide in the use of green manure crops and the application of animal manures before plantings are made. Most of the soils are low in organic matter, and best results have been obtained after green manure crops such as crotalaria have been plowed under, or after heavy applications of animal manures.

Types of Pasture to Establish

Dee recommends that a farmer establish three different types of pasture, and he has a rule-of-thumb based on experience by which he recommends the amount of each kind of pasture for a given number of grown animals on the farm. If the farmer wants grazing enough for 30 grown cattle, Dee will recommend the establishment of 15 acres of hop, white, and Persian clovers and Dallis grass, 15 acres of lespedeza (or lespedeza and Dallis grass), and 15 acres of kudzu. That's an average of 1½ acres of pasture for each grown animal, or an average of one-half of an acre of each kind of pasture for each animal.

Most of the grazing is furnished by the clover-Dallis grass pasture and the lespedeza-Dallis grass pasture. Kudzu provides supplemental grazing, "drought insurance," and hay. Kudzu is a perennial legume, deep-rooted and fleshy rooted and will provide grazing during the short summer droughts that prematurely "dry up" other pastures. Heavy grazing over a long period will eradicate kudzu. Aside from its erosion control value, one of its important functions on the farm is to provide hay.

After the first year, the clover-Dallis grass pasture normally will provide grazing from January 1 to May 15. From May 15 grazing should be alternated between the clover-Dallis grass pasture and the lespedeza-Dallis grass pasture. These two pastures will usually carry the herd from May 15 until October, unless a summer drought causes them to fail. In that event, kudzu pasture can be used to carry the livestock through. Gleanings from cultivated fields usually can be counted upon to carry the herd from October until January 1 when the grazing cycle begins again. Of course, as Dee points out, any grazing chart or schedule would be subject to the variables of weather, soil types, soil fertility, and organic matter content of the soil.

From experience, Dee believes that hop, white, and Persian clovers make the best combination for the Florida Parishes. White and Persian clovers usually come into grazing at about the same time, and the hop clover is the last to be ready for grazing. Toward the end of the grazing season, hop generally matures and dies first, Persian next, and white clover last. Grazing period of white clover usually is 4 to 6 weeks longer than that of hop clover, and 2 to 4 weeks longer than the graz-

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Potash for Citrus Crops in California

By M. E. McCollam

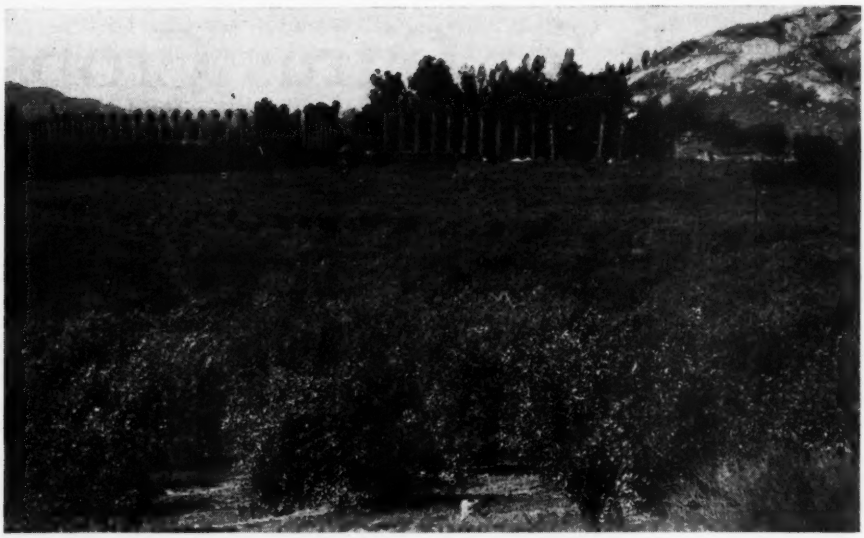
San Jose, California

THERE have always been differences of opinion about the effectiveness of potash in the fertilizer program for citrus trees in California. These different opinions undoubtedly have arisen from attempting to generalize about a situation which does not lend itself to generalization. The question of just the right make-up for a fertilizer recommendation will always be controversial when the answer is drawn from information too general in nature.

The citrus districts of California do not occur on large soil areas of the same chemical type and structural make-up. On the other hand, our citrus trees are planted on the widest possible range of soils from the physical standpoint, and fully as varied from the chemical standpoint. While it is true that the climatic factor has created a general soil need for organic matter and nitrogen, it is not surprising that other needs exist and that fertilizer recommendations of almost any kind, including most of the well known and lesser known plant-food elements, have produced favorable results at one place or another on this greatly varied soil cover.

Potassium or potash, as this element is more commonly called in fertilizer language, has been measured in California citrus soils and found to exhibit a wide range with extremes of 8 mg.

Valencia orange grove 16 years old on Ramona soil series, showing small tree size due to unfavorable soil conditions.



View of Lisbon lemon grove at Arlington, California, in which potash test plots have been conducted for the past 10 years.

of Neubauer potassium in the first foot on a Ramona sand to 44 mg. in the first foot on a Hanford sandy loam. The volume of soil testing thus far completed at least gives proof that soils in southern California exhibit a lower range of available potassium as well as a higher range.

These soil tests may or may not tell whether a citrus tree can get an optimum amount of potash from the soil. We know that on some soils of the Ramona series quite low in plant food the physical structure of the soil may restrict root development to such an extent that the tree may suffer at times from plant-food deficiencies. On some very gravelly and rocky types of citrus soil, the soil test may show a fairly good level of plant food, but it represents only that volume of soil between the rocks and gravel. As far as the writer knows this dilution factor is not taken into account when expressing the soil-test reading. It is conceivable that in such a soil a tree might actually become unprofitable because the volume of soil containing available plant food is smaller than we judge it to be.

On the other hand, citrus trees might be planted on a deep sandy soil of a low potash level, and the trees might be able to develop easily a tremendous root system and get enough potassium. This would be especially true if this sandy soil had a good "supplying power." If this "supplying power" were low, however, we would soon come to the point of poor trees and no profit.

In view of our soil variations, it does not seem surprising that many growers report satisfactory results from the use of potash on citrus groves in California. We have noted the range of readings for available potash in citrus soils. Aside from the fact that some of these soils give low potassium readings and therefore might be expected to respond to potash in the fertilizer program, there exists the possibility that physical characteristics of the soil may limit effective root development to a lesser soil mass, thereby also limiting the area from which available plant food can be drawn and making possible a response to potash.

During the past 10 years, potash applications have been made to large plots of citrus trees in various localities in

southern California. In most cases, the trees selected had been supplied with ample nitrogen through the grower's own fertilizer program, but commercial forms of potash fertilizer had not been included. The check block of trees was, therefore, the grower's own program, which did not include potash. For comparison, the potash plot consisted of an equal number of trees to which potash had been applied in addition to the grower's own program. The potash applications featured relatively large amounts per tree (from 8 to 10 pounds sulphate of potash). This would mean approximately 750 to 1,000 pounds per acre. In a number of cases, the applications were continued for six years and then stopped, but subsequent records are still being taken. The potash was not applied broadcast, but was concentrated in two furrows along the tree rows.

On the Jester grove of Lisbon lemons on Placentia loam soil at Arlington, potash applications were started in 1933. The trees received a total of 48 pounds sulphate of potash per tree over a 5-year period. None has been applied since 1937. This soil showed a test for potassium which would be considered adequate, yet by creating a concentrated zone of available potassium in the soil by the furrow application, a favorable response to potash was evident from comparative data recorded.

During the five years when potash applications were being made, 13 pickings of lemons were recorded on each block of 48 trees, and the total increase on the potash plot during this period amounted to 103 field boxes. Apparently, however, the favorable effects of potash are cumulative, as eight pickings of lemons recorded since 1937 show a total increase on the potash plot during the period amounting to 203 field boxes.

The average leaf analysis for potassium on these plots for the years 1941-43 revealed that the leaves from the potash-treated trees averaged 37 per cent higher content of potassium than the leaves from the check trees.

A uniform planting of young Eureka lemon trees on the Hamilton grove at Goleta was selected for another test in 1933. Plots were 52 trees each, and the 52 trees in the potash block were given five pounds sulphate of potash per tree for a period of six years, after which the potash applications were discontinued.

Valencia orange grove at Escondido, California, where favorable results from potash applications are being obtained.

During the early years of the test, yield differences were not apparent. In 1937, the yields for five pickings were —potash plot 155 field boxes, check plot 154½ field boxes. However, in 1939 the potash plot showed an increase of 18 boxes over the check plot, recorded in three pickings. In 1940, the difference became greater, and the potash plot yielded 41 more field boxes than the check plot. In 1942, a record

A high-yielding navel orange grove at El Cajon, California, on Monserate sandy loam soil where potash-treated block of trees has shown marked fruit quality improvement.

was obtained on one picking which showed 30 more field boxes on the potash plot than on the check plot. The evidence here also seemed to bear out the observation that the favorable effects of potash are cumulative over a period of years. Leaf analysis in 1942 showed that the leaves on the potash-treated trees still contained 16 per cent more potassium than the leaves from check trees.

One of the most interesting tests from the standpoint of records obtained was on the Jameson lemon grove at Corona. Potash applications were given to 48 trees at the rate of eight pounds sulphate of potash per tree for six years. The potash was applied in the bottom of the irrigation furrows, along the tree rows. This soil is classified as Yolo gravelly loam (high fan phase) and by present standards has an adequate amount of available potash. Evidently, however, by making a concentrated application in furrows, the lemon trees were able to make use of the additional potash.

Individual fruit counts were recorded on the 48 trees treated with potash and the 48 trees used as a check. These individual lemons were also graded in the packing house. This procedure was followed for 12 pickings from January 1937 to May 1939. Summarizing the record, we find that the potash treatment is credited with a total of 88,746 lemons and the check trees with 70,348 lemons, or a percentage increase of 26.1 per cent for the potash plot. Even though the yield on the potash plot was considerably greater, 58.7 per cent of the lemons were Sunkist grade while 56.5 per cent of the lemons from the check plot were Sunkist grade. It is rather inaccurate to try to transpose these individual lemon counts, without size information, to packed boxes of lemons, but using a 300-pack as a basis, it would mean roughly that the potash plot of 48 trees yielded 41 more packed boxes of Sunkist and 18 more of 2nd grade from the 12 pickings than the comparable check trees.

As the work with potash on fruit trees goes on, it appears that maximum response from this plant food is not secured the first year of application. It takes several years of potassium build-up before greatest benefit results. Even where heavy applications are made initially, this cumulative effect is apparent. True, there are instances where a favorable response can be measured during the season of application; but even in these cases, greatest benefit appears several years after potash applications are begun. Two potash tests on oranges in San Diego County illustrate this well.

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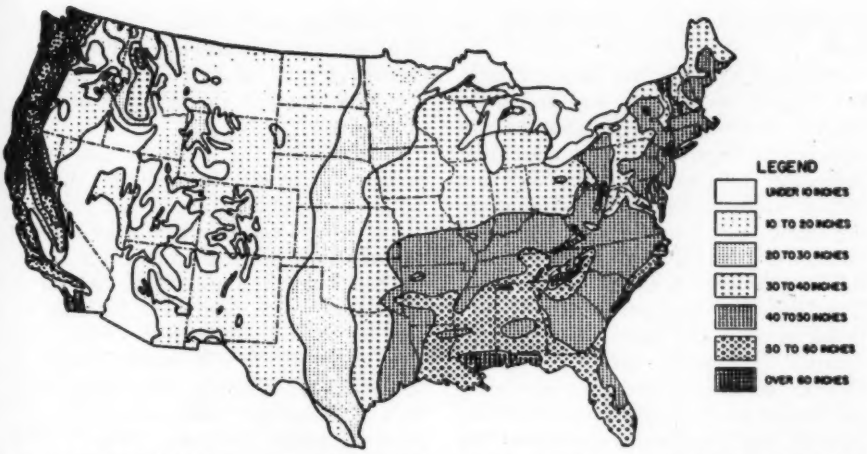

Fig. 1. High rainfall of eastern United States helps vegetation in exhausting the fertility of the soil to the forest level. Lower rainfall of western United States allows minerals to accumulate in the soil. The hundredth meridian marks the approximate balance between these soil-developing forces.

Why Do Farmers Plow?[1]

By Wm. A. Albrecht

Department of Soils, University of Missouri, Columbia, Missouri

THIS question comes to the fore now because of recent economic disturbances. When natural power in the form of concentrated sunshine collected on the farm and released locally through horses was replaced by machinery using imported liquid power collected in the ages past and stored in the great depths of the earth, the war's disruption of the far-flung distribution of fuels and oils and its deletion of our sources of rubber were not anticipated. These disturbances, both in terms of mechanics and economics, have led some to believe that high costs of plowing would be best relieved if plowing were discarded altogether as a farm practice. This belief is reinforced by successes under reduced plowing in some areas.

In the face of such a rising belief, the practice of plowing deserves a review of both its vices and its virtues. It deserves more searching thought than attention merely to those aspects that are psychological and economic. It deserves more than tabulation of its values, leisurely and short-sightedly considered. Productivity and plowing had many interactions and interrelations for the welfare of humans long before psychology and agricultural economics obtained academic classification as disciplinary mental activities, or a place as controlling forces in national policies. Production and plowing will, in all probability, still be basic when impending international changes bring many of us back to a much closer rela-

[1] The second of two articles on the controversial subject, "Do Farmers Plow Too Much?" The first discussion appeared in the June-July issue of this magazine.

tion to the soil than we now believe we have.

We need to plow less on some soils. We need to plow more and deeper on others. We need to learn that the differences in degree of soil development according to climatic differences are factors in determining how important the plow is. The farmers in Ohio haven't invested so much in clod-breaking machinery without provocation. The "one-way" land preparer of Kansas is not so successful purely because of its unusual mechanical design. The soil physical conditions, premised on chemical aspects controlling them, have some role in these differences between the forest-bearing soils and those of the prairie-grass growing areas.

There is need to call out against excessive plowing if it occurs, but it is well to note whether it is the advent of the plow or the exit of the soil fertility that needs correction in improved soil conservation thinking. Certainly soil conservation is more than simple mechanics, simple physics, and simple psychology. It calls for some real friends of the land who will try to understand the soil and crop production therefrom in their fundamental connections, to say nothing of the tillage of the soil in all of its ramifications, even into psychology for all of us so dependent in the final analysis on the productivity of the land.

Fortunately, the plow is merely a tool in this whole matter under discussion. The concern about the practice of plowing is one that brings into question the judgment of him who is using the tool, and the purposes he has for it in relation to the soil as a national as well as an individual asset. One cannot condemn the rifle or the pistol as tools because these are now being used in war, when they can render so many more desirable services. Nor would we condemn the mechanics of the automobile when in its human destruction the fault is not one of the machine but rather one of "the nut that holds the wheel." Our knowledge about plowing and our understanding of soils and not the combination of simple moldboard, share, and beam, as handiworks of the engineer, are on trial.

Have you ever thought that plowing may be different according as the soils, the vegetation, and even the animals are different? A few wild turkeys and a few squirrels were the population

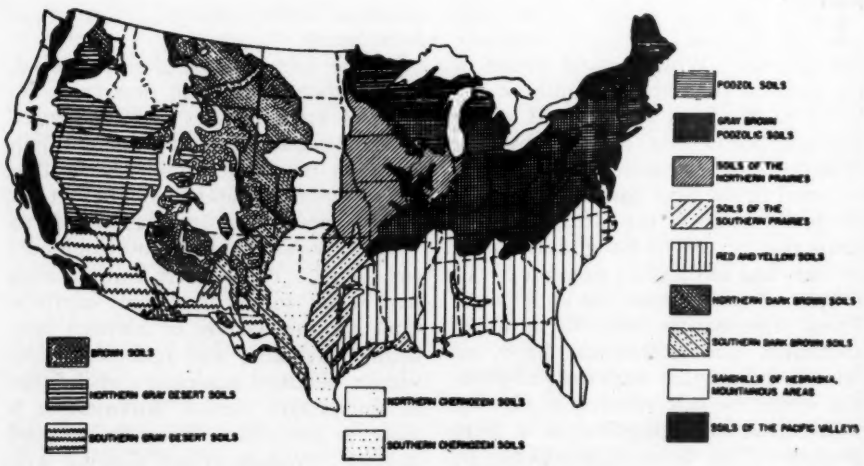

Fig. 2. Different amounts of rainfall make different soils. Different soils make different crops. The fertility supply and its accessibility in the soil are more significant in determining the crops than the amount of water or the temperature. Plant food more than climate determines the plant array. (Marbut's soil map.)

limit in the forest for the Puritans Those same soils, cleared of the forest and cultivated were soon abandoned as agricultural land by the pioneers who were willing to face the hazardous movement westward. All of these facts have not commonly been related to the low rate, and low total, of nutrient delivery by those soils of the lime, the phosphorus, the nitrogen, and other chemical elements needed to make nourishing vegetation for the building of healthy animal and human bodies. Soils that had come down to the low fertility delivery represented by the forest level of vegetation before man plowed them are offering so little for animal body-building that the plow must stir them and every possible help is needed to encourage rapid release of the essential mineral nutrients from the meager stock of organic matter within them. Woody vegetation, according to different acclimated tree or shrub species, and a woody composition of any plant species, including farm crops, are characteristic of "the underprivileged vegetation," on such soils unless they are plowed and stirred to increase the rate of decomposition within the soil of residues of plant generations gone before, or are treated by fertility uplifters in chemical fertilizers and other manures.

But on the prairies, where lesser rainfalls have not developed the soil into what is old age, or more maturity, so far as leaching experiences and nutrient losses are concerned, the vegetation is richer in protein. It is also more concentrated in minerals that contribute to bone-building in animal bodies. The soil itself and not the plowing of it determines these conditions. In going from more rainfall to less rainfall or from eastern to western Kansas, for example, the protein concentration in the wheat goes up. We call it "hard wheat" because, as we commonly say, it grows in regions of lower rainfall. More properly it is "hard wheat" because it is grown on those soils that have more nutritional minerals for the micro plants within, and for the macro plants above them. These mineral supplies are producing not only protein-

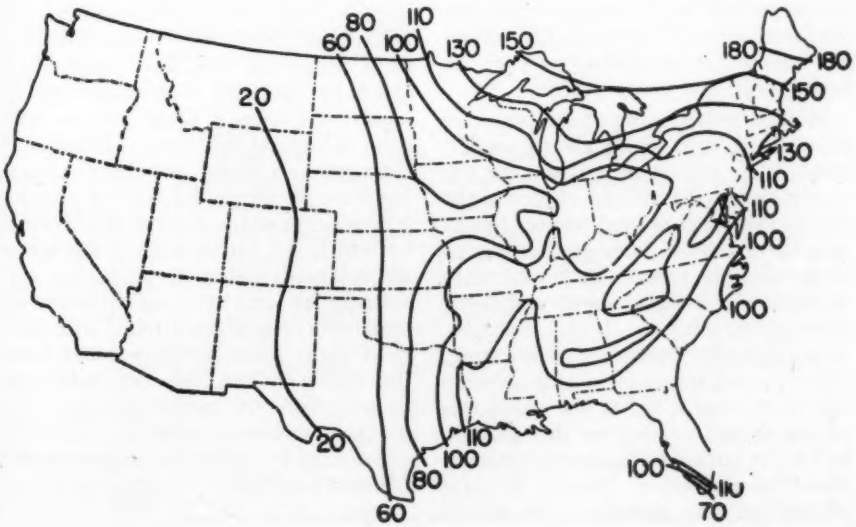

Fig. 3. Larger land bodies and greater distances from seashore modify the effects of the rainfall in making soil. The balance of precipitation against evaporation from free water surface (100) explains why the central states are a part of the western prairies with their soils less leached of their fertility. (Map by Transeau.)

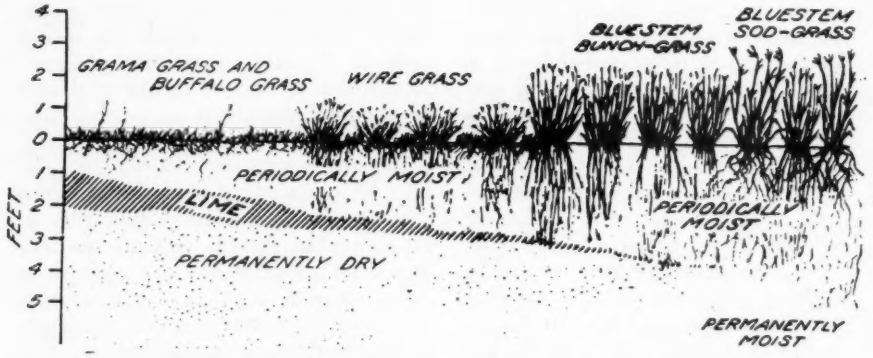

Fig. 4. Increasing soil fertility, particularly calcium, within reach of the plant roots in going from eastern to western Kansas is responsible for the increasing protein content of wheat in going that same direction. (Sketch by Schantz.)

rich forages in legumes like alfalfa, but also protein-rich grain in non-legumes like wheat. Such soils have lime and other minerals nearer their surface where plants can get them to make vegetation rich in calcium, encouraging nitrogen fixation, protein production, and other mineral contributions, all to support animals more effectively than is possible by plants, mainly of fuel value on the highly developed forest soils. We surely cannot subscribe to the belief that all "principles valid for the forest are valid for the fields," when the soils differ as widely as they do under forest and under prairie.

Mineral provisioning of the plants by the soils is now more clearly understood. The ideas coming from the soil mineralogists, the colloid chemists, the plant physiologists and other fundamentals of natural laws are helping us to visualize the processes whereby plant nutrition is brought about and what plowing does for it. It was once believed that plant nutrients were coming from the soil minerals in true solution and were caught up as the plant was taking in and passing on this solution as a water stream to maintain transpiration from the leaves. Studies in plant physiology have recently given us the concept that the nutrient ions move according to physico-chemical laws dealing with the kinds and concentrations of the nutrients on the clay; with the different nutrient ions within the roots in terms of concentration, absorption, and the elaboration into the plant compounds; and with a root membrane interposed between the clay colloid of the soil and the complex colloid within the root.

Plowing has been much confused with water movements from the soil through the plant possibly more by imagination than by actual demonstration. Water moving into the root follows its laws of ionic and molecular behaviors. These are quite different from those of capillary movements given by the high water-table experiments of Professor King. These laws seem to suggest that there is little travel by water as a liquid and that the plant has little to do in the way of control. The concept of the plant as the channel by which soil forces holding the water are balanced against air conditions dissipating it seems to be logical when we remember that plant stubbles and such dead plant parts transpire water from the soil. Plowing has not been connected with the newer concept that nutrient movement from the soil to the plant may be occurring independently of these Gulliverian wanderings of soil water.

Plant nutrient ions like calcium, magnesium, potassium, and others are held on the finer clay part of the soil in an adsorbed form against loss therefrom

by water. They are, however, exchangeable by other ions, particularly hydrogen as an especially active one. That hydrogen is the main item, which the plant exchanges to the clay for what ions the clay offers in trade as plant nourishment, is now fairly well understood as the mechanism of plant feeding. This occurs through a most intimate contact by plant roots with the soil particles. Plant roots extend themselves through the soil to get their nourishment by means of this trading process. Little credence can be placed in the belief common only a decade ago, that the soil gives nutrients to the plant. The performance fits more nearly into the country boy's understanding of how we get milk from cows, when he said, "our cows don't give milk, we take it from them."

The effects by the root as a nutrient gatherer may extend through a distance from the root of but a few layers of clay particles right next to the root. This is limited probably to distances in millimeters, certainly not to such extensive distances as centimeters. The root systems' effects as nutrition are also commensurate with the total root surfaces. Accordingly, then, the densely matted collection of roots under bluegrass takes more total nutrients from the colloidal part of the soil than does the sparsely rooted crop, like soybeans.

Each root leaves the soil in its immediate zone of activity exhausted to a very low level. The advent of the root has opened channels by which nutrients could go out and energy compounds come in. In fact, it brings about, either directly or indirectly through its own decay and bacterial activities, a reduction of the compounds of the soil about its area of penetration. This reduction may be indicated by a color change from the customary reddish to the drab gray soil, much like we know it to be brought about by water-logging. One might expect roots of the next crop to follow successively in these old exhausted root channels, if the soil were not stirred. Plowing serves as a mixing agent to redistribute this reduced clay amongst those clay portions that were not so nearly exhausted of their supplies of nutrients.

That plowing is more essential for this purpose than we commonly believe is indicated by the increasing report of observations of deficiency symptoms suggesting plant diseases of some crops, such as cereals and some of the legumes in such a close sequence as to reduce the amount of plowing. Soils put under fall-pastured barley as nurse

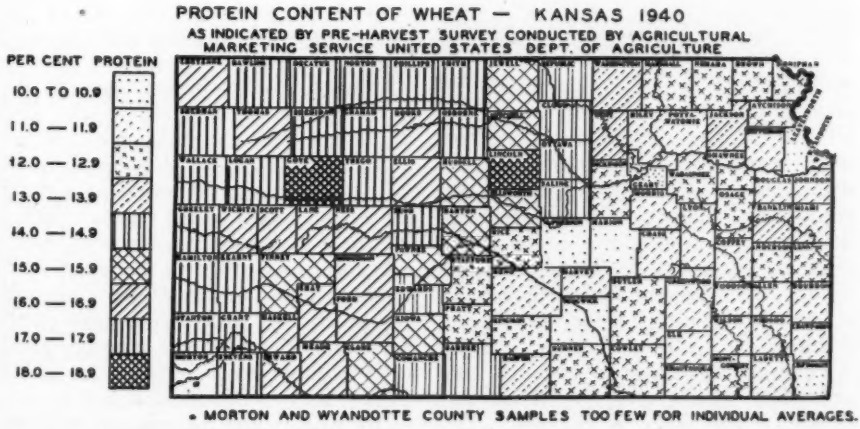
PROTEIN CONTENT OF WHEAT — KANSAS 1940
AS INDICATED BY PRE-HARVEST SURVEY CONDUCTED BY AGRICULTURAL MARKETING SERVICE UNITED STATES DEPT. OF AGRICULTURE
PER CENT PROTEIN
10.0 TO 10.9
11.0 — 11.9
12.0 — 12.9
13.0 — 13.9
14.0 — 14.9
15.0 — 15.9
16.0 — 16.9
17.0 — 17.9
18.0 — 18.9
* MORTON AND WYANDOTTE COUNTY SAMPLES TOO FEW FOR INDIVIDUAL AVERAGES.

Fig. 5. The increase in protein content of wheat, from 10 to 18%, in going from eastern to western Kansas follows the increasing supply of fertility in the upper soil horizon. Hard wheats are determined by the soil more than by weather or rainfall.

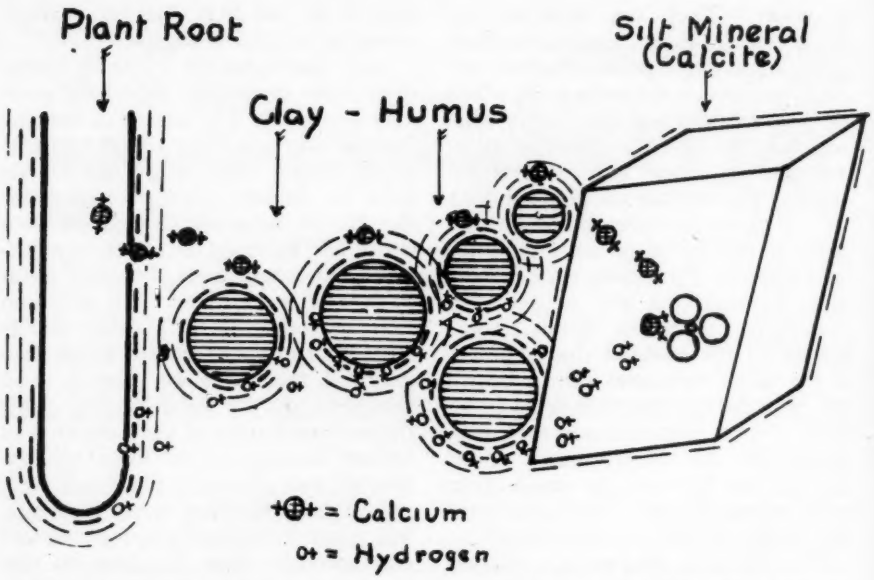

Fig. 6. Nutrients, like calcium, move from the mineral to the colloidal clay and humus, and from there to the plant roots (right to left). Hydrogen, or acidity, traded by the root for nutrients, goes in the opposite direction to break down the mineral crystals like limestone and to put the calcium nutrient into availability for the plant.

crop for summer-pastured lespedeza to be disced and to go to barley again in another annual cycle with only this limited tillage are showing nutrient deficiencies that are not prevalent under plowing. Plowing serves to shuffle the exhausted soil surface into contact with other surfaces not so depleted. It is apparently significant for the crop nutrition that such soils be plowed between even two successive crops. It may be true that the farmer cannot appreciate the colloid chemistry and low levels of nutrients in the soil concerned with the crop disease symptoms, but he does appreciate the improvement in the crops after he plows. He is justified in developing a reverence for the plow much as you and I develop a reverence for the dining-room or the kitchen, if reverence of that type is the limit in our thinking.

Plowing serves for nutritional improvement of the crop by mixing the different clay areas in the soil. Dr. Graham's researches at the University of Missouri have recently pointed out that plowing may be instrumental for better plant nourishment because it shifts the connection between the surfaces of the clay and surfaces of the silt, or the larger mineral particles of the soil not commonly considered so active as exchange performers. He demonstrated that the nutrient ions in the mineral silt moved to the clay in the absence of plants, and that plants picked them from there to their better growth advantage than from the minerals directly. Periodic shuffling of the clay in contact with the surfaces of the silt particle, or after the clay has become saturated during the period of contact for a few months, is the means of keeping more of the clay loaded with nutrients to be passed on to the plant root. Plowing is the means whereby enough clay in the soil picks up enough nutrients from the silt, and other original reserve supplies of fertility, in active forms and in amounts sufficient to give us the quality and the quantity of crops we need to produce.

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Do Farmers Naturally Adjust Their Crops?

By C. B. Sherman

U. S. Department of Agriculture, Washington, D.C.

WAR is not the only stimulus that makes wide-awake farmers shift and adjust their crops and output. We are always hearing that farmers are notoriously slow to change. But out in the Corn Belt, where farming methods may seem at firsthand to be rather set and standardized, farmers have been shifting and changing in accordance with changing conditions for 30 years.

Just look at the record. Investigators in the U. S. Department of Agriculture have been doing that very thing, covering first one region and crop and then another, as an aid to understanding present abilities to meet emergencies and as a guide in forming agricultural policies along feasible lines.

Taking the Corn Belt as an example, what have they found? Summarized roughly in a page or two, it is evident that in spite of ups and downs, droughts and depression, the typical Corn Belt farmers of various types for the last five years have been operating larger farms than ever before, doing more business than at any time for three decades, and making better incomes. This has come about primarily through using improved crop varieties, labor-saving machinery, and better livestock, rotations, and management.

But these farming operations have not merely grown and improved through the varying years. Frequent adjustments show up in the course of the 30-year records, made so skillfully that the incomes have moved up too. Although the typical cash-grain farmer now operates about one-third more land than 30 years ago, he does it with about one-third less hired labor and he has increased his output by about 70 per cent. And although the families are smaller now, they do a larger proportion of the work themselves.

This farmer is getting more flue-cured from less acreage. He is typical of growers who have reduced their tobacco acreage by 10 per cent in the last 30 years, but have increased their yields by 37 per cent.

Here is a significant note: More than 93 per cent of these farmers now have tractors and more than 90 per cent of their corn acreage is planted with hybrid seed corn.

Farmers who fatten hogs and beef have made a decided shift, but less than

cash-grain farmers. Formerly, they bought most of the cattle they fattened; now they breed and raise most of the cattle they feed out. They have increased the size of their farms. They now have more productive pasture; also hay production is more than one-fourth higher than 30 years ago, corn yields have increased by nearly 10 bushels an acre, and the production of hogs has increased by 43 per cent.

Corn-Belt farmers who go in for a hog-and-dairying combination have not only increased their acreages and the number of cows in their herds, but they now have higher producing cows. They have increased production of hogs by 35 per cent, and hay by 37 per cent. Their families were already working about as much as they could, so these additions have meant more hired labor.

At the lower end of the scale of changes in the Corn Belt come the farms that raise hogs and beef. These farms are smaller and less level than the grain farms so they can't use labor-saving machinery so effectively, and their proportion of hybrid seed corn is only about half as large. Drought liquidation of livestock was severe. Yet their combined output in a recent 5-year period was 24 per cent higher than during a 5-year period three decades ago.

Now take tobacco as representing another crop and a very different area and type of farmer. Flue-cured and fire-cured tobacco are selected as examples—both grown in Virginia. Flue-cured tobacco, one of the principal types used in cigarettes, was in greatly heightened demand during World War I, and later the export market was more favorable to it than to fire-cured, although fire-cured was once considered an export crop. As a result of conditions and prices, some producers of fire-cured have abandoned the crop, either for flue-cured if their soils are suitable or for some other crop entirely. Of those who have stayed by fire-cured, the typical producer in Virginia has gradually reduced his acreage of tobacco and now has one-third less than 30 years ago, but he is getting about 20 per cent higher yields than 10 years ago and is producing about 87 per cent as much tobacco as in 1928-32.

Typical flue-cured farmers, enjoying better demand and better prices, have

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Hybrid seed and tractors have the right of way on Corn Belt farms.

Soybeans from the Baker farm, Elkhart county, Indiana, 1942, black sandy loam. Left to right: unfertilized, 9.9 bu. per acre; 500 lbs. of 0-8-24, 22.4 bu.; 1,000 lbs. of 0-8-24, 27.4 bu. The fertilizer was broadcast and plowed under.

More Soybeans, Please

By Geo. H. Enfield

Purdue University Agriculture Extension Service, Lafayette, Indiana

THE war cry is for more of everything, especially soybeans. With the same amount of land, less labor, and older machinery it is important that every acre producing soybeans be operated at maximum efficiency.

Every farmer has noticed that beans will produce larger yields on fertile than infertile soils. This shows that soybeans, like other crops, need adequate plant food. Long-time fertility experiments in Indiana have demonstrated repeatedly how soybeans can "eat at the second table," that is, they respond to the residual fertility placed in the soil for previous crops in the rotation. The yields have been increased on the average from 3.2 to 10.6 bushels per acre for the sound practice of applying 400 to 600 pounds of adapted fertilizer along with lime and manure to the rotation.

The sensitiveness of soybeans to chemical fertilizer when placed in contact with the seed has limited the rate of application to about 150 pounds per acre. On many of our soils this quantity of fertilizer would obviously not carry enough plant food to give large increases.

On 50-bushel corn soils, light row fertilization of soybeans pays. Results from a three-year experiment on fertile land at the Soils and Crops Farm at Lafayette show that the increase for applying fertilizer with the attachment on the corn planter for row-seeded beans is about 70% greater than for applying the same treatment with the wheat drill with beans seeded solid. In these tests the unfertilized crop averaged 27.8 bushels of soys per acre. Drilling 100 pounds of 0-20-20 in bands on either side of the row with the fertilizer attachment on the corn planter at seeding time increased the yield 3.3

TABLE 1.—EFFECTS OF LIMING AND METHOD OF APPLYING FERTILIZER FOR SOYBEANS ON A CLERMONT SILT LOAM, ACID (pH 4.8), POORLY-DRAINED SOIL NEAR NORTH VERNON, INDIANA.[1]

Fertilizer	Rate per acre pounds	Method of application	Yield unlimed	Increase Bu. per Acre	
				Lime[2] alone	Lime and fertilizer
.....	.....	.....	8.4	6.7	.....
0–12–12	666	Disked in surface	6.8	.....	9.7
0–12–12	666	Plowed under	9.6	.....	13.2

[1] Experiments conducted by John Larson, A. J. Ohlrogge, M. T. Vittum, Purdue University Agricultural Experiment Station, 1942.
[2] 3 tons limestone per acre (acidity reduced to pH 5.8).

bushels per acre. With the present price of beans well over $1.50 per bushel, this increase is sufficient to make this method of fertilization of row-seeded soybeans very profitable.

Plow-under fertilization is better than surface application. Where the fertilizer was applied with the grain drill at planting time or disked into the surface soil before planting, the yields have not been as large as where the fertilizer was applied to the unbroken land and plowed under. In dry seasons, the fertilizer placed near the surface is in dry soil and out of the reach of feeding roots. However, if the fertilizer is placed deeper, the roots can get it out of the moist soil. In wet seasons, fertilizer placed near the surface encourages weed growth. Results from one experiment showed that the weed competition was so severe where 666 pounds of 0-12-12 were applied to the surface of the soil and disked in that the yield was decreased 1.6 bushels per acre. The same treatment plowed under increased the yield. The plow-under method allows larger quantities of fer-

A poor stand but still too many beans for this potash-deficient soil, as indicated by the marginal yellowing of the leaves.

tilizer to be applied without any danger of injuring germination of the seed.

Acid soils should be limed for soybeans. The results in table 1 clearly illustrate the need for limestone on acid soils that are to be planted to soybeans. Although the beans were inoculated at planting time, only a few nodules formed on the plants grown on this acid soil without lime and the plants always had the appearance of being starved for nitrogen. The beans planted on the limed soil were greener throughout the growing season and were fairly well nodulated. Applying limestone without adequate plant food would lead to further depletion of an already infertile soil, and to smaller yields. In other experiments on the same soil type, similar results were obtained. They show that on strongly acid and infertile soils neither limestone nor fertilizer alone will do as well as when teamed together. It takes the combination of both to put such land in condition to produce soybeans at maximum efficiency.

Potash produces large increases in soybean yields. Apparently soybeans are very sensitive to potash deficiency. In 1942, eight cooperative fertilizer demonstrations with farmers were completed, in which either 0-12-12, 0-10-20, or 0-8-24 was used. They are reported in table 2. Two rates of fertilization, 500 and 1,000 pounds per acre, were compared with the unfertilized. Two of these demonstrations were on potash-deficient, black, sandy loam soils. In these two demonstrations, the unfertilized beans produced only 14.5 bushels per acre, and there was considerable marginal firing of the leaves. The fertilizer showed an average increase of 13.1 bushels per acre for the 500-pound rate and 16.6 bushels for the 1,000-pound treatment; thus it is seen that the 500-pound rate is the practical one to use.

In a previous demonstration, straight 60% potash, applied at the rate of 300 pounds per acre, increased the yield of soybeans more than 20 bushels per

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TABLE 2.—RESULTS OF BROADCASTING AND PLOWING UNDER FERTILIZERS ON YIELDS OF SOYBEANS IN DEMONSTRATION TESTS WITH INDIANA FARMERS IN 1942.[1]

Cooperator and county	Kind of soil	Fertilizer used	Yield of unfertilized soys, Bu/A	Increase in Bu. per A. for fertilizer at	
				500 lbs. per A.	1,000 lbs. per A.
H. L. Hendrickson Clinton	Light silt loam	0–12–12	16.5	2.5	5.0
Baker Elkhart	Black sandy loam	0– 8–24	9.9	12.9	17.8
F. Grube Jasper	Black sandy loam	0–12–12	18.0	13.4	15.4
Atkinson Newton	Black sandy loam	0–10–20	26.5	3.8	4.7
L. E. Ranford Newton	Light sandy loam	0–12–12	9.4	4.3	6.4
John Smith Owen	Light silt loam	0–12–12	13.7	4.0	4.9
E. G. Fry Pulaski	Black sandy loam	0–12–12	7.3	3.1	5.5
J. L. Buller Spencer	Droughty silt loam	0–12–12	8.5	1.4	1.5

[1] This was a season of good rainfall.

Tobacco Demands the Best Fertilizer

By Henry Maddux

Agricultural Extension Service, State College Station, Raleigh, N. C.

"JUST any kind of fertilizer" will not do for tobacco. Extension experts at North Carolina State College say that tobacco is one of our most responsive crops and that it must have a fertilizer made of the proper materials and these in the right proportions, if it is to produce good yields of high quality leaf.

Tobacco never sits on the fence, waiting for something to happen. It is always going either forward or backward. Cotton, for instance, may wait for a considerable period and then grow a big crop in a week's time, but tobacco never does this. Whatever the grower does for his crop is either right or wrong, and he must be particularly careful to do just the right thing at the right time. Proper fertilization, together with suitable growing conditions, plays a big part in determining tobacco profits.

Market demands for flue-cured tobacco have shown decided changes in the last 20 years and fertilizer manufacturers are, in general, producing fertilizers that fill the requirements of the tobacco plant, as recommended by the research and experimental workers.

Most tobacco soils in North Carolina have a pH reading ranging from 5.0 to 6.0, and the majority of tobacco fertilizers are manufactured to meet the needs of a tobacco soil having a pH reading of 5.6 for average conditions. Neither extremely acid nor sweet soils are best for growing tobacco.

In the 3-8-3 fertilizer of former days, the tobacco experts found that the nitrogen overbalanced the amount of phosphate and potash, where 1,000 pounds of fertilizer were used per acre. The greatest change in tobacco fertilizers in recent years lies in the amounts of potash recommended, with maximums of 10 to 15 per cent potash.

It has been found, however, that more than 6 to 8 per cent potash in fertilizer used at planting interferes with obtaining a good stand. To overcome this, the experts inaugurated top-dressing tests and found that the use of additional potash as a top-dressing within 20 days after transplanting gave excellent results. Many manufacturers have prepared special tobacco top-dressers.

Method of Application

The experts say that the most efficient way of applying fertilizer for tobacco is in bands three to four inches to the side of the row at the approximate level of the root crowns, with the plants being set between the bands. However, many growers do not have the equipment for doing this job and they depend on another method, which gives approximately the same results as the band method.

The distributor, which puts the fertilizer in the row, is followed with an adjustable six-inch sweep and large fronts. This allows the soil and the fertilizer to be thoroughly mixed. When the list is thrown on one side, half of the fertilizer is turned into the bottom of the furrow. Completing the listing process throws the other half of the fertilizer on top of the list, thoroughly mixing the fertilizer and the soil from the bottom to the top of the list.

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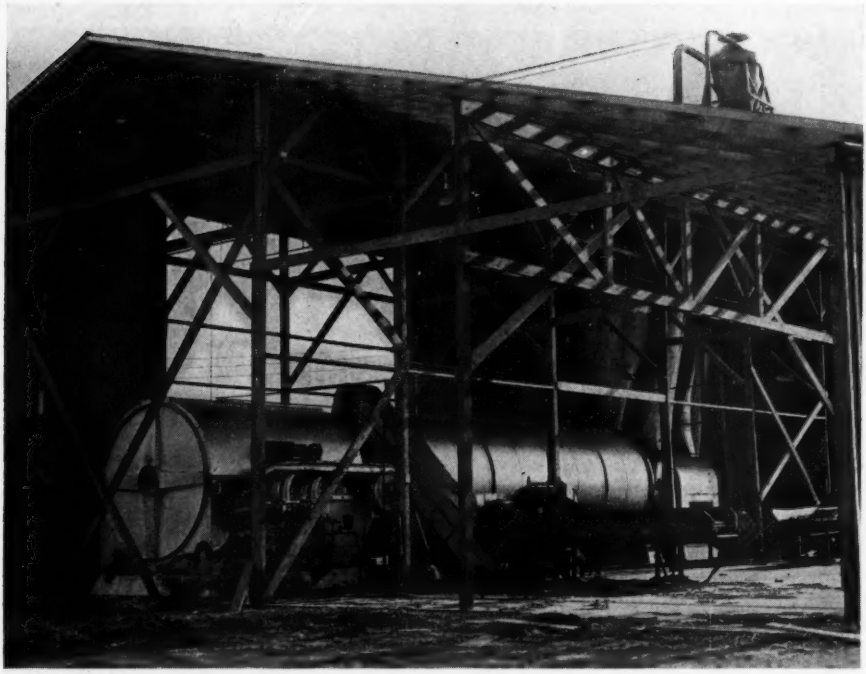
PICTORIAL

THE BEGINNING AND ENDING OF MANY A FARMER'S DAY.

©Courtesy Union Pacific Railroad Agricultural Development Department

Vacation Land—Dreams of which were all most Americans could enjoy this year.

Work like this furnished the "needed change" for a host of the more patriotic.



Above: Alfalfa dehydrator, where green alfalfa is chopped, heated and dried, and ground to make alfalfa meal. Maplecrest Turkey Farms, Louisa County, Iowa.

Below: Frank Jamison, Louisa County, Iowa, uses this haystacker on his tractor to solve the labor and high cost of baling problems.

The Editors Talk

Pastures, that Come to Stay

There is no doubt that a widespread interest in pastures has been revived and is here to stay. They are being regarded as one of the greatest undeveloped resources in American agriculture. Now the efforts of the specialists who saw need for treating pastures as a very important farm crop are being turned to pastures that will come to stay.

We appreciate the privilege of presenting in this issue of the magazine Charles G. Webb's report on what is being done along this line in Louisiana and what may be expected over large areas of the Old Cotton South. Mr. Webb believes that grassland agriculture will have an important role in the making of a New South, healing and making profitable millions of acres of idle land, eroded land, and land grown weary with decades of cotton production. He cites the enthusiasm of banker, barber, and minister for this means of freeing their communities from the one-crop system of farming and its ill effects on the entire populace. He gives instances of where land producing as high as 1½ bales of cotton per acre is now producing more income from pasture. And he tells about the driving force behind this amazing pasture development program and the methods being used in achieving success.

"No hit-or-miss procedures and no guess work go into the making of these lush, money-making, food-producing pastures," Mr. Webb says. "Methods are exact and scientific. Before any pasture is established three fundamental questions are answered: (1) What is the physical condition of the soil and what amounts of plant nutrients and organic matter does it contain; (2) What additional nutrients and organic matter are required to grow profitably the desired legumes and grasses; and (3) How many acres of pasture does the farmer need for the number of dairy or beef animals he wishes to maintain?"

This "attack" to the problem of maintaining permanent and continuous pasture is one which should be used in all sections of the country, for if pastures are to be treated as an important farm crop, they deserve the same careful consideration of their plant-food needs as cash crops get. It has been said that an average cow in grazing will remove from the soil 115 pounds of nitrogen, 26 pounds of phosphoric acid, 93 pounds of potash, and 37 pounds of calcium oxide. It therefore is no wonder that pastures, which in the majority of past farming practices have been allotted to land not suitable for other crops and have been sadly neglected, have run out.

After the capabilities of the soil along with needed supplements of plant food are determined, the next step is the selection of pasture crops best suited to the region. This of course will vary, north, south, east, and west, but with the many new species of grasses and legumes which have been introduced and suc-

cessfully grown over the past few decades, a pasture that will come to stay is within the reach of every livestock farmer.

Boron in Agriculture

A symposium on boron in agriculture was held under the auspices of the Division of Fertilizer Chemistry of the American Chemical Society at its meeting in Pittsburgh, Pa., on September 6. The chairman in his introductory remarks recalled briefly the ill repute of borax in fertilizers of 25 years ago in contrast with the high esteem enjoyed by that plant food at the present time.

Attesting to that esteem were eminent agronomists, soil chemists, and plant physiologists who presented the fundamental scientific and practical aspects of boron in plant nutrition—soil and plant-tissue analysis for boron content; the inter-relationship between potassium, calcium, and boron in the soil; cellular breakdown within plant tissue resulting from boron deficiency; and the effect of borax in increasing the seed set of legumes, notably alfalfa, the fruiting of the grape, and the per-acre yield of legumes, again notably alfalfa.

That boron deficiency can no longer be regarded as a local phenomenon is evidenced by the fact that those on the symposium program represented that vast agricultural area lying between Wisconsin on the west, Canada on the north, and Florida on the south. In certain of these states, state-wide soil surveys have been made to determine the level of available boron as a guide to borax application. The fallacy of delaying borax application until appearance of boron-deficiency symptoms was emphasized, it being pointed out that irreparable crop damage has already been suffered before the appearance of that critical period in crop growth.

This leads to the suggestion that borax be added to all fertilizers designed for use on soils of low boron content in amounts sufficient to serve as insurance against this frequently unsuspected impairment of crop yield. These invaluable contributions to agricultural science, it was announced, will be printed in an early issue of Soil Science.

Dean Carl E. Ladd

On July 23 in the untimely passing of Carl E. Ladd, Dean of the College of Agriculture at Cornell, New York State lost one of her favorite sons. National sympathy brought a fuller realization of this loss not only to the State but the Nation, for in his short span of 55 years, Dean Ladd had made felt his influence for the betterment of American agriculture and agricultural education.

Ever maintaining a sincere understanding of the countryside, from which he sprang, his courage, exceptional capabilities, and vision brought into his work with such agencies as the Association of Land-Grant Colleges and the Farm Credit Administration an appreciation of practical methods needed to effect better rural living. His particular field of interest was farm management and in his experience he counted months spent in Europe studying conditions on farms and completing his views on world agriculture.

At this time when the efficient production and use of food is just as important as the efficient production and use of munitions, Dean Ladd's passing can well be recorded as the loss of a high-ranking officer in America's war effort.

Farm Prices of Farm Products*

	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
1910-14 Average	12.4	10.4	69.6	87.6	64.8	88.0	11.94	21.59	....
1920	32.1	17.3	249.5	175.7	144.2	224.1	21.26	51.73	....
1921	12.3	19.5	103.8	118.7	58.7	119.0	12.96	22.18	....
1922	18.9	22.8	96.7	104.8	58.5	103.2	11.68	35.04	....
1923	26.7	19.0	84.1	104.4	80.1	98.9	12.29	43.69	....
1924	27.6	19.0	87.0	137.0	91.2	110.5	13.28	38.34	....
1925	22.1	16.8	113.9	171.6	99.9	151.0	12.54	35.07	....
1926	15.1	17.9	185.7	156.3	69.9	135.1	13.06	27.20	....
1927	15.9	20.7	132.3	114.0	78.8	120.5	12.00	28.56	....
1928	18.6	20.0	82.9	112.3	89.1	113.4	10.63	37.70	....
1929	17.7	18.6	93.7	118.4	87.6	102.7	11.56	34.98	....
1930	12.4	12.9	124.4	115.8	78.0	80.9	11.31	26.25	....
1931	7.6	8.2	72.7	92.9	49.8	48.8	9.76	17.04	....
1932	5.8	10.5	43.3	57.2	28.1	38.8	7 53	9.74	....
1933	8.1	12.9	66.0	59.4	36.5	58.1	6.81	12.32	....
1934	12.0	17.1	68.0	79.1	61.3	79.8	10.67	26.12	....
1935	11.6	16.1	49.4	73.9	77.4	86.4	10.57	35.56	....
1936	11.7	17.2	99.6	85.3	76.7	96.0	8.93	31.78	....
1937	11.1	19.9	88.3	91.8	94.8	107.1	10.36	30.24	....
1938	8.3	17.2	55.5	76.9	49.0	66.1	7.55	21.13	....
1939	8.7	13.6	68.1	75.4	47.6	63.6	6.95	22.17	....
1940	9.6	15.1	70.7	85.2	59.0	73.9	7.62	24.31	....
1941	13.3	19.1	64.6	94.4	64.3	84.0	8.10	35.04	....
1942	18.51	28.3	110.0	108.3	79.5	101.8	10.05	44.42	....
July	18.55	31.0	124.5	112.2	83.1	94.6	9.06	43.20	....
August	18.03	33.5	115.4	137.3	83.4	95.4	8.89	44.04	....
September	18.59	35.1	107.7	120.5	82.6	102.6	9.03	45.33	....
October	18.87	42.3	102.5	107.9	77.5	103.5	9.39	46.46	....
November	19.22	39.8	108.4	103.5	75.9	104.4	9.84	45.01	....
December	19.55	40.0	111.8	110.3	80.2	110.3	10.46	44.72	....
1943									
January	19.74	35.1	117.8	121.4	88.0	117.5	11.20	44.34	....
February	19.68	18.2	125.7	129.8	90.4	119.5	11.94	44.88	....
March	19.91	16.0	145.1	153.6	94.8	122.7	12.28	45.73	....
April	20.13	16.0	166.8	179.2	100.2	122.3	12.61	45.89	....
May	20.09	37.6	190.7	225.1	103.4	122.8	12 66	46.11	....
June	19.96	57.0	188.0	222.0	106.0	124.0	12.20	46.40	....
July	19.60	59.0	167.0	267.0	108.0	126.0	11.90	44.50	....

Index Numbers (1910-14 = 100)

1920	259	166	358	201	223	255	178	240	....
1921	99	187	149	136	91	135	109	103	....
1922	152	219	139	120	90	117	98	162	....
1923	215	183	121	119	124	112	103	202	....
1924	223	183	125	156	141	126	111	177	150
1925	178	161	164	196	154	172	105	162	153
1926	122	172	267	178	108	154	109	126	143
1927	128	199	190	130	122	137	101	132	121
1928	150	192	119	128	138	129	89	175	159
1929	143	179	135	135	135	117	97	162	149
1930	100	124	179	132	120	92	95	122	140
1931	61	79	104	106	77	55	82	79	117
1932	47	101	62	65	43	44	63	45	102
1933	65	124	95	68	56	66	57	57	105
1934	97	164	98	90	95	91	89	121	104
1935	94	155	71	84	119	98	89	165	126
1936	94	165	143	97	118	109	75	147	113
1937	90	191	127	105	146	122	87	140	122
1938	67	165	80	88	76	75	63	98	101
1939	70	131	98	86	73	72	58	103	109
1940	78	145	102	97	91	84	64	126	121
1941	107	184	93	108	99	95	68	162	145
1942	149	272	158	124	123	116	84	206	199
July	150	298	179	128	128	108	76	200	200
August	145	322	166	157	129	108	74	204	256
September	150	338	155	138	127	117	76	210	191
October	152	407	147	123	120	118	79	215	226
November	155	383	156	118	117	119	82	208	238
December	158	385	161	126	124	125	88	207	293
1943									
January	159	338	169	139	136	134	94	205	277
February	159	175	181	148	140	136	100	208	301
March	161	154	208	175	146	139	103	212	302
April	162	154	240	205	155	139	106	213	291
May	162	362	274	257	160	140	106	214	253
June	161	548	270	253	164	141	102	215	308
July	158	567	240	305	167	143	100	206	315

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11-12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Fish scrap, wet acidulated, 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16-17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.05	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	3.54	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.25	4.59	5.16
1924	2.99	2.44	5.87	5.02	4.41	3.60	4.25
1925	3.11	2.47	5.41	5.34	4.71	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.15	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.35	4.32	5.70
1928	2.67	2.30	7.06	6.63	5.28	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.69	4.61	5.72
1930	2.47	1.81	4.78	4.96	4.15	3.79	4.58
1931	2.34	1.46	3.10	3.95	3.33	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.82	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.58	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.84	2.67	3.27
1935	1.47	1.15	4.59	3.10	2.65	3.06	3.65
1936	1.53	1.23	4.17	3.42	2.67	3.58	4.25
1937	1.63	1.32	4.91	4.66	3.65	4.04	4.30
1938	1.69	1.38	3.69	3.76	3.17	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.12	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.35	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.27	3.76	4.43
1942	1.74	1.41	6.11	5.77	3.34	5.04	6.76
July	1.75	1.41	5.99	5.77	3.34	4.86	6.80
August	1.75	1.42	5.77	5.77	3.34	4.86	6.94
September	1.75	1.42	5.69	5.77	3.34	4.86	6.97
October	1.75	1.42	5.72	5.77	3.34	4.86	6.80
November	1.75	1.42	6.06	5.77	3.34	4.86	6.53
December	1.75	1.42	5.68	5.77	3.34	4.86	6.53
1943							
January	1.75	1.42	5.68	5.77	3.34	4.86	6.53
February	1.75	1.42	5.83	5.77	3.34	4.86	6.53
March	1.75	1.42	6.30	5.77	3.34	4.86	6.53
April	1.75	1.42	6.29	5.77	3.34	4.86	6.53
May	1.75	1.42	6.29	5.77	3.34	4.86	6.53
June	1.75	1.42	6.30	5.77	3.34	4.86	6.53
July	1.75	1.42	6.30	5.77	3.34	4.86	6.71

Index Numbers (1910-14 = 100)

1922	113	90	173	132	117	140	142
1923	112	102	177	137	140	136	147
1924	111	86	168	142	145	107	121
1925	115	87	155	151	155	117	135
1926	113	84	126	140	136	129	139
1927	112	79	145	166	143	128	162
1928	100	81	202	188	173	146	170
1929	96	72	161	142	154	137	162
1930	92	64	137	141	136	112	130
1931	88	51	89	112	109	63	70
1932	71	36	62	62	60	36	39
1933	59	39	84	81	85	97	71
1934	59	42	127	89	93	79	93
1935	57	40	131	88	87	91	104
1936	59	43	119	97	89	106	121
1937	61	46	140	132	120	120	122
1938	63	48	105	106	104	93	100
1939	63	47	115	125	102	115	111
1940	63	48	133	124	110	99	96
1941	63	49	157	151	107	112	126
1942	65	49	175	163	110	150	192
July	65	49	171	163	110	144	193
August	65	50	165	163	110	144	197
September	65	50	163	163	110	144	198
October	65	50	163	163	110	144	193
November	65	50	173	163	110	144	186
December	65	50	162	163	110	144	186
1943							
January	65	50	162	163	110	144	186
February	65	50	167	163	110	144	186
March	65	50	180	163	110	144	186
April	65	50	180	163	110	144	186
May	65	50	180	163	110	144	186
June	65	50	180	163	110	144	186
July	65	50	180	163	110	144	191

Wholesale Prices of Phosphates and Potash**

	Superphosphate Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Kainit, 20% bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657	$0.655
1922	.566	3.12	6.90	.632	.904	23.87	....	.508
1923	.550	3.08	7.50	.588	.836	23.32	....	.474
1924	.502	2.31	6.60	.582	.860	23.72	....	.472
1925	.600	2.44	6.16	.584	.860	23.72	....	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537	.524
1927	.535	3.09	5.50	.646	.924	25.55	.586	.581
1928	.580	3.12	5.50	.669	.957	26.46	.607	.602
1929	.609	3.18	5.50	.672	.962	26.59	.610	.605
1930	.542	3.18	5.50	.681	.973	26.92	.618	.612
1931	.485	3.18	5.50	.681	.973	26.92	.618	.612
1932	.458	3.18	5.50	.681	.963	26.90	.618	.591
1933	.434	3.11	5.50	.662	.864	25.10	.601	.565
1934	.487	3.14	5.67	.486	.751	22.49	.483	.471
1935	.492	3.30	5.69	.415	.684	21.44	.444	.488
1936	.476	1.85	5.50	.464	.708	22.94	.505	.560
1937	.510	1.85	5.50	.508	.757	24.70	.556	.607
1938	.492	1.85	5.50	.523	.774	25.17	.572	.623
1939	.478	1.90	5.50	.521	.751	24.52	.570	.607
1940	.516	1.90	5.50	.517	.730	....	.573	....
1941	.547	1.94	5.64	.522	.748	25.55	.570	....
1942	.600	2.13	6.29	.522	.748	25.74	.205	....
July	.600	2.20	6.50	.503	.755	26.00	.197	....
August	.600	2.20	6.50	.503	.755	26.00	.197	....
September	.600	2.20	6.50	.503	.755	26.00	.197	....
October	.600	2.10	6.20	.535	.755	26.00	.210	....
November	.600	2.00	5.90	.535	.755	26.00	.210	....
December	.600	2.00	5.90	.535	.755	26.00	.210	....
1943								
January	.600	2.00	5.90	.535	.755	26.00	.210	....
February	.600	2.00	5.90	.535	.755	26.00	.210	....
March	.608	2.00	5.90	.535	.755	26.00	.210	....
April	.640	2.00	5.90	.535	.755	26.00	.210	....
May	.640	2.00	5.90	.535	.755	26.00	.210	....
June	.640	2.00	5.90	.471	.665	22.88	.176	....
July	.640	2.00	5.90	.503	.755	26.00	.188	....

Index Numbers (1910-14 = 100)

1922	106	87	141	89	95	99	....	78
1923	103	85	154	82	88	96	....	72
1924	94	64	135	82	90	98	....	72
1925	110	68	126	82	90	98	....	74
1926	112	88	114	83	90	98	82	80
1927	100	86	113	90	97	106	89	89
1928	108	86	113	94	100	109	92	92
1929	114	88	113	94	101	110	93	92
1930	101	88	113	95	102	111	94	93
1931	90	88	113	95	102	111	94	93
1932	85	88	113	95	101	111	94	90
1933	81	86	113	93	91	104	91	86
1934	91	87	116	68	79	93	74	72
1935	92	91	117	58	72	89	68	75
1936	89	51	113	65	74	95	77	85
1937	95	51	113	71	79	102	85	93
1938	92	51	113	73	81	104	87	95
1939	89	53	113	73	79	101	87	93
1940	96	53	113	72	77	....	87	....
1941	102	54	116	73	78	106	87	....
1942	112	59	129	73	78	106	84	....
July	112	61	133	70	79	108	83	....
August	112	61	133	70	79	108	83	....
September	112	61	133	70	79	108	83	....
October	112	58	127	75	79	108	85	....
November	112	55	121	75	79	108	85	....
December	112	55	121	75	79	108	85	....
1943								
January	112	55	121	75	79	108	85	....
February	112	55	121	75	79	108	85	....
March	113	55	121	75	79	108	85	....
April	119	55	121	75	79	108	85	....
May	119	55	121	75	79	108	85	....
June	119	55	121	66	70	95	80	....
July	119	55	121	70	79	108	82	....

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer materials‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash
1922.....	132	149	141	116	101	145	106	85
1923.....	142	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	157	151	112	100	131	109	80
1926.....	145	155	146	119	94	135	112	86
1927.....	139	153	139	116	89	150	100	94
1928.....	149	155	141	121	87	177	108	97
1929.....	146	153	139	114	79	146	114	97
1930.....	126	145	126	105	72	131	101	99
1931.....	87	124	107	83	62	83	90	99
1932.....	65	107	95	71	46	48	85	99
1933.....	70	109	96	70	45	71	81	95
1934.....	90	123	109	72	47	90	91	72
1935.....	108	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	121	130	126	81	50	129	95	75
1938.....	95	122	115	78	52	101	92	77
1939.....	93	121	112	79	51	119	89	77
1940.....	98	122	115	80	52	114	96	77
1941.....	122	130	127	86	56	130	102	76
1942.....	157	152	144	92	57	161	112	76
July.....	154	153	144	91	57	157	112	74
August....	163	153	145	91	57	155	112	74
September.	163	154	145	91	57	154	112	74
October...	169	155	145	92	57	154	112	78
November.	169	156	146	92	57	158	112	78
December..	178	158	147	92	57	154	112	78
1943								
January...	182	160	149	92	57	154	112	78
February..	178	162	149	92	57	155	112	78
March....	182	163	150	93	57	160	113	78
April.....	185	165	151	95	57	160	119	78
May.....	187	167	152	95	57	160	119	78
June.....	190	168	151	93	57	160	119	69
July.....	188	169	150	94	57	160	119	74

* U. S. D. A. figures.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.

**** The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ The use of rapid soil tests and the appearance of plants to aid in the management of greenhouse soils is very thoroughly discussed by C. H. Spurway in Michigan Agricultural Experiment Station Special Bulletin 325, "Soil Fertility Control for Greenhouses." This bulletin is intended to be used with related bulletins prepared by the author, Michigan Agricultural Experiment Station Technical Bulletin 132, "Soil Testing," and Michigan Agricultural Experiment Station Special Bulletin 306, "Soil Reaction (pH) Preferences of Plants."

The author stresses the importance of having the proper supply and particularly the proper balance of nutrients in soil, whether in the greenhouse or other places. He presents data based on actual experience showing the ranges for various nutrients that have been found satisfactory and those that are considered optimum. He has found that these ranges will hold for nearly all of the commonly grown greenhouse crops. Maximum tolerances of certain materials such as chlorides, nitrites, aluminum, and ammonium also are given. It is felt that if the tests are used to measure the amounts of the various materials in the soil, a much more intelligent handling of greenhouse soils will be possible. Each of the important nutrients or other chemicals likely to be present or troublesome in greenhouse soils is discussed more or less in detail. These include nitrogen in its various forms, potassium, phosphorus, calcium, magnesium, iron, manganese, sulphate, boron, copper, zinc, carbonates, aluminum, chlorides, chlorine, sodium, sulfides, total soluble salts, and soil reaction. Since many greenhouse soils were found to be in poor physical condition, a section discusses methods of correcting this. The problem of proper water supply and control also is covered.

A section of the bulletin is devoted to plant symptoms or attempts to diagnose difficulties by means of observing abnormalities of plants growing on the soil. The difficulties likely to be encountered in this procedure are mentioned, and include such factors as differentiating among various causes of what appears to be the same type of abnormality. Another weakness of depending entirely on abnormalities in the plant is the fact that conditions are pretty bad when they show up and it is much more efficient to prevent their appearance than try to correct the difficulty after it occurs, since there will be a period of greater or lesser length during which the plant is suffering but does not yet show any symptoms. In other cases, the high amounts of nutrients frequently applied to greenhouse soils prevent the appearance of deficiency symptoms, although the plant may not be getting all that it could use under the highly intensive growing conditions present in greenhouses. As a case in point, the author mentions that potassium-deficiency symptoms seldom are found in greenhouses. When these abnormalities do appear, however, their use along with soil tests frequently can be helpful. The final portion of the bulletin is devoted to a listing of fertilizer and other materials frequently or

commonly used in the greenhouse, the amounts that usually are applied, and the effects they are likely to have on the soil.

"Rice Fertilization," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 430, May 1943, Martin Nelson.

"Commercial Fertilizers Agricultural Minerals," Dept. of Agr., State of Calif., Sacramento, Calif., Sp. Publ. 196, June 1943.

"Bureau of Chemistry Announcement No. FM-65," Dept. of Agr., State of Calif., Sacramento, Calif., July 22, 1943.

"The Boron Problem in Illinois," Dept. of Agron., Univ. of Ill., Urbana, Ill., AG1161, June 1943, C. H. Stinson and E. E. DeTurk.

"How to Fertilize Corn Effectively in Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Bul. 482, Jan. 1943, G. D. Scarseth, Harry L. Cook, Bert A. Krantz, and Alvin J. Ohlrogge.

"Fertilizer Tonnage for New York," Dept. of Agron., Cornell University, Ithaca, N. Y., Mimeo. No. 707, June 9, 1943.

"Apply Borax to Improve Quality of Sweet Potatoes," Agr. Exp. Sta., N. C. State College of Agr. & Eng., State College Station, Raleigh, N. C., Sp. Cir. 1, April 1943, L. G. Willis.

"Liming Practices," Agr. Ext. Serv., State College Sta., Raleigh, N. C., E. Cir. 264, March 1943.

"The Yield and Composition of Cigar-leaf Tobacco as Influenced by Fertilizer and Preceding Crop," Agr. Exp. Sta., State College, Penna., Bul. 440, Feb. 1943, D. E. Haley, O. E. Street, M. A. Farrell, and J. J. Reid.

"Getting the Most from Fertilizers for Vegetable Crops," Agr. Exp. Sta., State College, Penna., Bul. 443, March 1943, E. M. Rahn.

"Quenched Calcium Silicate Slag, A By-Product Substitute for Limestone and Superphosphate," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. 184, March 1943, W. H. MacIntire and S. H. Winterberg.

"Relation of Fertilizer Practices to Certain Important Soil Types of the Limestone Valley and Uplands of Virginia," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 351, March 1943, S. S. Obenshain and P. T. Gish.

"Fertilizer Tonnage for West Virginia," Dept. of Agron. & Genetics, W. Va. Agr. College, Morgantown, W. Va., 1942.

Soils

¶ The correction of soil acidity is fundamental in maintaining or building up the fertility of nearly all soils in the humid section. The practical aspects of the subject are well covered by R. W. Donaldson and A. B. Beaumont in Massachusetts Agricultural Extension Leaflet 134, Revised, entitled, "Liming Soils." Benefits likely to be obtained from liming acid soils for the crops commonly grown in Massachusetts are given. Soil acidity and the methods of expressing acidity by means of the pH scale are explained. A helpful table gives the optimum pH range for practically all crops grown in New England. Testing soils for acidity is briefly considered and amounts of lime that should be used for various degrees of acidity on different kinds of soil are shown. The various kinds of liming materials commonly found on the market are described together with recommendations on their use and how to purchase them advantageously.

"Use Soil Conservation to Increase Production on Your Farm," Ext. Serv., Univ. of Ark., Fayetteville, Ark., Leaf. 47, 1943.

"Terracing for Erosion Control in Indiana," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., E. Bul. 288, Jan. 1943, R. C. Shipman and R. O. Cole.

"Contouring and Grassed Waterways Made Easy," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Pamphlet 63, March 1943, F. S. Parks, M. A. Anderson, and D. K. Struthers.

"Soil and Field-Crop Management for the Catskill-Mohawk Area of New York," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Bul. 789, Dec. 1942, A. F. Gustafson.

"Aggregation of an Orchard and a Vegetable Soil Under Different Cultural Treatments," Agr. Exp. Sta., Wooster, Ohio, Bul. 640, May 1943, Leon Havis.

"Summary of Research Findings at the Red Plains Conservation Experiment Station, Guthrie, Okla.," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-99, May 1943, Harley A. Daniel, Harry M. Elwell, and Maurice B. Cox.

"Providence County Rhode Island—Soil Survey," U. S. D. A., Washington, D. C., Series 1938, No. 3, April 1943, A. E. Shearin, S. V. Madison, W. S. Colvin, and Vladimir Shutak.

"The Effects of Rye, Lespedeza, and Cowpeas When Used as Cover Crops and Incorporated with the Soil on the Leachings from Dunmore Silt Loam Soil," Agr. Exp. Sta., Blacksburg, Va., T. Bul. 83, Feb. 1943, H. H. Hill.

"Food for Freedom by Better Range-Conservation Practices in the Pacific Northwest," U. S. D. A., Washington, D. C., Mis. Publ. 514, April 1943, W. T. White, W. R. Frandsen, R. R. Humphrey, and N. T. Nelson.

"Erosion Lowers Wartime Production on Northeastern Farms," U. S. D. A., Washington, D. C., Mis. Publ. 516, March 1943.

"Farming for Greater Production of War Crops in the Intermountain and Southwestern Country," U. S. D. A., Washington, D. C., Mis. Publ. 517, April 1943.

Crops

¶ The cotton contests conducted in South Carolina since 1926 undoubtedly have had a most stimulating influence in improving growing practices on this important crop. These contests are sponsored by the Agricultural Extension Service in cooperation with the Cotton Manufacturers' Association of South Carolina. The results for 1942 have recently been issued in Clemson Agricultural College Extension Service Circular 229, "The Cotton Contest—1942." The first two prizes were awarded to growers producing 7,505 lbs. of lint with the staple of $1\frac{1}{32}$ inches and 7,140 lbs. of lint with staple length of $1\frac{1}{16}$ inches respectively. These remarkable yields of high quality cotton show what can be done with good cultural practices, combined with good seed of improved varieties. When the contest began in 1926, less than half of the contestants produced cotton with a staple length of $\frac{15}{16}$ inch or better, while in 1941 and 1942, all contestants produced cotton of this staple length or longer. Based on the results of the contestants, conclusions are given on practices to be followed to produce good yields of good cotton.

Good quality seed from a variety known to produce staple of 1 inch or longer should be treated before planting. The soil should be fertile, well drained, prepared early with rows 34 to 40 inches apart. Side placement of fertilizer is desirable, that is, in bands along the row 2 to 3 inches to the side of the seed and 2 inches below the seed level. If machinery is not available for this method of application, the fertilizer can be applied in a row and well mixed with the soil. The average fertilizer analysis used by the contestants was a 4-8-6 usually supplemented with side-dressings so that the total fertilization was approximately a 1-1-1 ratio. After chopping, side-dressings with 100 to 150 lbs. of nitrogen fertilizer were made, and if rust had appeared in the previous crop, 50 to 100 lbs. of muriate of potash or the equivalent was applied. If a legume cover crop is turned under, the nitrogen can be reduced in proportion. Lime should be applied according to the acidity of the soil. Planting should be done as early as is safe, and the plants should be thinned carefully so as to have a good stand. Cultivation frequent enough to control weeds, proper steps to control insects and diseases, and careful harvesting all should follow at the proper times. Farmers growing cotton yields such as are obtained in this contest are helping materially in the war effort.

¶ U. S. Department of Agriculture Farmers' Bulletin No. 1656, "Peanut Growing," by W. R. Beattie and J. H. Beattie, has been revised and re-issued. This bulletin covers very completely the various phases of peanut growing. In connection with the fertilization of the crop, a table is included giving the fertilizer recommendations of the various states in which the crop is grown. All states recommend the use of phosphate and potash, and some include also nitrogen in the fertilizer recommendations. The authors find that a medium percentage of potash is generally indicated, but in some cases, high potash is called for. They also point out that some states recommend that fertilization be given other crops in the rotation, rather than peanuts. While peanuts are a legume, it is brought out that this crop as ordinarily grown does not improve the soil. If the straw is fed and the manure carefully handled, or if the straw is directly returned to the soil, depletion will not be as great as frequently is the case. Lime is particularly important in connection with the quality of the peanuts.

"Twenty-First Annual Report of the Canadian Plant Disease Survey 1941," Dept. of Agr., Div. of Botany & Plant Path., Central Exp. Farm, Ottawa, Canada, April 1942, I. L. Conners.

"Biennial Report of the Commissioner of Agriculture," Conn. Dept. of Agr., Hartford,

Conn., Pub. Doc. No. 18, July 1, 1940, to June 30, 1942.

"Tobacco Substation at Windsor," Agr. Exp. Sta., New Haven, Conn., Bul. 469, April 1943, P. J. Anderson, T. R. Swanback, and S. B. LeCompte, Jr.

"The Pasture Season—Second Half," Agr. Ext. Serv., Univ. of Conn., Storrs, Conn., July 1943, J. S. Owens.

"More Tomatoes for the War Effort," Agr. Exp. Sta., Newark, Del., 1942, E. P. Brasher.

"1942 Report Florida Agricultural Extension Service," Agr. Ext. Serv., Univ. of Fla., Gainesville, Fla.

"Twenty-Second Annual Report 1941-1942," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Bul. 35, July 1942.

"Agricultural Science on the War Front," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, Hawaii, April 1943, J. H. Beaumont.

"Bromegrass and Bromegrass Mixtures," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., Bul. 496, June 1943, R. F. Fuelleman, W. L. Burlison, and W. G. Kammlade.

"Spring Oats in Illinois," Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 549, March 1943, G. H. Dungan and W. L. Burlison.

"Sweet Clover for Illinois," Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 559, June 1943, O. H. Sears and W. L. Burlison.

"Science Solves Farm Problems and Aids Agricultural Production," Agr. Exp. Sta., Lafayette, Ind., June 1942.

"Your Key to Good Pastures," Agr. Exp. Sta., Lafayette, Ind., Leaf. 244, 1943.

"Report on Agricultural Research, Part I," Agr. Exp. Sta., Ames, Iowa, 1942.

"Report on Agricultural Research, Part II," Agr. Exp. Sta., Ames, Iowa, 1942.

"Iowa Year Book of Agriculture, 1941," Iowa State Dept. of Agr., Des Moines, Iowa, June 1942.

"The Victory Garden in the Home Food Supply 1943," Agr. Ext. Serv., Ames, Iowa, Pamp. 60, Feb. 1943.

"Tomato Production in Kansas," Agr. Exp. Sta., Manhattan, Kansas, Bul. 313, April 1943, S. W. Decker and W. G. Amstein.

"Comparative Values of Crops for Different Sections of Minnesota Data from Experiment Station Trials 1921-41," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Bul. 365, April 1943, H. K. Hayes.

"Field Beans for Minnesota," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., E. Folder 117, May 1943, A. C. Arny and R. C. Rose.

"Propagation of Fruits for the Home Orchard," Agr. Exp. Sta., State College, Miss., Bul. 375, Feb. 1943, C. H. Ragland.

"Sweetpotato Production," Agr. Exp. Sta., State College, Miss., Bul. 378, April 1943, W. S. Anderson and John W. Randolph.

"Growing Potatoes in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 464, March 1943, Aubrey D. Hibbard.

"Good Pasture and Roughage in Fattening Cattle," Agr. Exp. Sta., Columbia, Mo., Bul. 466, April 1943, E. A. Trowbridge and A. J. Dyer.

"Available Publications," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., S. Cir. 104, May 1943.

"Irrigated Crop Rotations," Agr. Exp. Sta., Bozeman, Mont., Bul. 414, May 1943, Dan Hansen and A. H. Post.

"Fifty-Five Years of Agricultural Research on Ranch and Range," Agr. Exp. Sta., Univ. of Nevada, Reno, Nevada, Bul. 163, March 1943, S. B. Doten.

"Agricultural Research in New Hampshire," Agr. Exp. Sta., Durham, N. H., Bul. 345, Dec. 1942.

"Blueberries in the Garden," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 457, May 1943, Charles S. Beckwith.

"Fifty-Third Annual Report," Agr. Exp. Sta., State College, N. M., 1941-1942.

"Birdsfoot Trefoil," N. Y. State College of Agr., Ithaca, N. Y., Bul. 561, Jan. 1943, G. H. Serviss and H. A. MacDonald.

"Better Pastures for Low-Cost Summer Milk," College of Agr., Cornell Univ., Ithaca, N. Y., Bul. 567, W. E. Bul. 71, Feb. 1943, E. L. Worthen.

"Buckwheat, an Emergency Feed and Food Crop," College of Agr. Cornell Univ., Ithaca, N. Y., Bul. 582, W. E. Bul. 85, March 1943, H. B. Hartwig.

"List of Bulletins of the Ohio Agricultural Experiment Station, Wooster, Ohio," Agr. Exp. Sta., Wooster, Ohio, Sp. Cir. 62 (Rev.), April 1943.

"Experiments with Irish Potatoes: Time of Planting; Seed Sources; Varieties; Irrigation; Fertilizers; Time of Harvest; and Storage of the Spring Crop," Agr. Exp. Sta., Stillwater, Okla., T. Bul. No. T-18, March 1943, H. B. Cordner.

"Rotational Grazing of Irrigated Pasture," Agr. Exp. Sta., Corvallis, Ore., Sta. Cir. of Inf. No. 311, April 1943, H. P. Ewalt.

"The Pennheart Tomato," Agr. Exp. Sta., State College, Penna., Bul. 438, Jan. 1943, C. E. Myers.

"The Conservation of Alfalfa, Red Clover, and Timothy Nutrients as Silages and as Hays. II," Agr. Exp. Sta., Burlington, Vt., Bul. 494, June 1942, O. M. Camburn, H. B. Ellenberger, C. H. Jones, and G. C. Crooks.

"Soybean Production," Agr. Exp. Sta., Blacksburg, Va., Bul. 345, Dec. 1942, T. B. Hutcheson.

"Peanut Production," Agr. Exp. Sta., Blacksburg, Va., Bul. 348, Feb. 1943, E. T. Batten.

"Hay Production in Washington," Agr. Ext. Serv., Pullman, Wash., E. Bul. 304, May 1943, Alvin G. Law and I. M. Ingham.

"Forage Seed Production in Eastern Washington," Agr. Ext. Serv., Pullman, Wash., E.

Cir. 59, April 1943, Alvin G. Law and I. M. Ingham.

"Irrigation of Vegetables and Berries in the Home Garden," Agr. Ext. Serv., State College of Wash., Pullman, Wash., E. Cir. 60, June 1943, L. J. Smith.

"Epistle to the Farm," Agr. Exp. Sta., Morgantown, W. Va., Bul. 307, March 1943, C. R. Orton.

"Hybrid Corn in Wyoming, 1942," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo., Bul. 261, April 1943, William A. Riedl and W. L. Quayle.

"Report of Cooperative Extension Work in Agriculture and Home Economics," 1941-42," U. S. D. A., Washington, D. C.

"Grapes for Different Regions," U. S. D. A., Washington, D. C., F. B. 1936, May 1943, C. A. Magoon and Elmer Snyder.

"Fish for Food from Farm Ponds," U. S. D. A., Washington, D. C., F. B. 1938, May 1943, Verne E. Davison and J. A. Johnson.

"Woodlands in the Farm Plan," U. S. D. A., Washington, D. C., F. B. 1940, May 1943, John F. Preston.

"Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations 1942-43," U. S. D. A., Washington, D. C., Mis. Publ. 510, May 1943.

"Contribution to the Morphology and Anatomy of Guayule (Parthenium argentatum)," U. S. D. A., Washington, D. C., T. Bul. 842, April 1943, Ernst Artschwager.

"Effect of Climate on the Yield and Oil Content of Flaxseed and on the Iodine Number of Linseed Oil," U. S. D. A., Washington, D. C., T. Bul. 844, April 1943, A. C. Dillman and T. H. Hopper.

Economics

¶ Government agricultural agencies have conducted an extensive campaign to persuade farmers to grow more peanuts, primarily as a source of edible oil. Last year, farmers responded patriotically to this appeal and many of them grew peanuts for the first time, too frequently with rather indifferent results. The Government is this year again calling on farmers to grow large acreages of peanuts, and it looks as though this will be continued until the end of the war at least. Some of the problems from the farm management viewpoint connected with growing of peanuts as related to other crops, have been studied by F. D. Barlow, Jr., and George Townsend, and are presented in Louisiana Agricultural Experiment Station Bulletin 361, "Peanuts as a Wartime Crop in Louisiana." The authors frankly point out some of the factors which caused disappointing results in 1942 and what steps have been taken in 1943 to eliminate these. Equipment, handling and marketing facilities, and differential pricing were the factors that bothered farmers most last year and that the Government believes it has taken care of during the coming year. Getting good yields and managing the peanut crop in competition with or as a supplement to other crops are problems each individual farmer has to work out, and the bulletin presents much helpful information in this connection.

Peanuts tend to compete directly with cotton for labor, and to some extent for land, and they also tend to compete to a less extent with corn. So many farmers were cotton growers, and possibly indifferent peanut growers, that the question has been raised as to whether or not it might be better to have farmers concentrate on growing cotton, and get the oil from cottonseed, rather than trying to grow peanuts. The authors point out that peanut oil is considered superior to cottonseed oil for many purposes. Second, farm land suitable for peanut production will very frequently produce rather poor quality cotton, particularly with reference to staple lengths, and there already is an excess of short staple cotton in the country. The third, and probably most important factor, is that on soil of a given fertility with a given amount of effort peanuts will produce much more oil than cottonseed.

In a comparison of costs of production and returns in 1942 from peanuts, cotton, and corn in Louisiana, cotton was by far the most profitable crop to grow, with the yields ordinarily obtained. Peanuts gave only a little over a third as much profit per acre as cotton, while corn was less profitable than peanuts on an acre basis. Cotton requires the most labor per acre, peanuts above ⅔ as much as cotton, and corn only ⅓ as much. These calculations were based on 1942 conditions. The authors believe that peanuts will be in a position to compete more favorably

with cotton in 1943. They present helpful tables showing the returns per acre likely to be obtained with different yields of cotton, corn, and peanuts per acre at various prices per unit of crop harvested.

During May and June, cotton and peanuts compete directly for farm labor, and these are the peak months for both crops during the growing season. They also compete during September in the harvesting season. The authors urge farmers to keep in mind, however, that peanuts require only two-thirds as much total labor as cotton, and therefore where labor is short, they might well consider shifting some of their cotton acreage to peanuts, since with prices likely to prevail during 1943, the return per acre from peanuts is likely to be very favorable compared to returns from cotton.

A section of the bulletin is devoted to practices in 1942 which appeared to be successful in getting a favorable yield of peanuts. It was found that better results usually were obtained when the crop was planted on a well-drained, light, sandy loam soil. Peanuts should not be planted on the same land two years in succession. The land should be well prepared and free of trash. While peanuts sometimes do not need fertilizer if they are grown in a rotation of highly fertilized crops, the authors believe that most of the peanut acreage in 1943 will be planted on lands that received comparatively small applications of fertilizer in 1942, and they therefore urge that steps be taken to provide fertilizer. They suggest 200 lbs. per acre of fertilizer such as 3-12-6 or 4-10-7, although they state that 200 lbs. of 3-8-8 have been highly satisfactory in North Carolina. If the soil is acid, lime should be applied. Information on planting, cultivation, digging, and curing also is given.

"Ethnic Group Relations in a Rural Area of Connecticut," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Bul. 244, Jan. 1943, Nathan L. Whetten and Arnold W. Green.

"Adjustments for Greater Profits on Small Flue-Cured Tobacco Farms," Agr. Exp. Sta., Gainesville, Fla., Bul. 387, June 1943, Max E. Brunk and C. M. Hampson.

"An Economic Study of Farm Labor in Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Bul. 478, Dec. 1942, B. R. Bookhout.

"A Guide to Agricultural Programs in South Central Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Bul. 480, Oct. 1942, Lynn S. Robertson.

"Indiana Crops and Livestock," Agr. Exp. Sta., Purdue Univ., West Lafayette, Ind., No. 207, Dec. 1942.

"Wartime Prices and Agriculture," Agr. Exp. Sta., College Park, Md., Bul. No. A18, Oct. 1942, P. R. Poffenberger and S. H. DeVault.

"Pasture Production and Use," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Bul. 368, May 1943, Hjalmer O. Anderson, C. Herman Welch, Jr., and George A. Pond.

"Inflation on Our Doorstep," Cornell Univ., Ithaca, N. Y., A. E. 445, June 1943, F. A. Harper and W. M. Curtiss.

"Levels of Living and Population Movements in Rural Areas of Ohio, 1930-1940," Agr. Exp. Sta., Wooster, Ohio, Bul. 639, March 1943, A. R. Mangus and Robert L. McNamara.

"Peanut Production Costs and Income in Oklahoma in 1942," Agr. Exp. Sta., Stillwater, Okla., E. Bul. No. B-267, May 1943, Desmond L. W. Anker and Melvin S. Slusher.

"Feed—Per Acre and Per Hour," Agr. Exp. Sta., Stillwater, Okla., E. Bul. No. B-268, May 1943, Peter Nelson and E. A. Tucker.

"Production and Marketing of Potatoes in Rhode Island," Agr. Exp. Sta., Kingston, R. I., Bul. 287, Nov. 1942, J. L. Tennant and Alexander Joss.

"9 Steps in Grading Soybeans," Ext. Serv., U. S. D. A., Washington, D. C., AWI-35, May 1943.

"10 Steps in Grading Grain Sorghums," U. S. D. A., Washington, D. C., AWI-36, May 1943.

"6 Steps in Grading Flaxseed," U. S. D. A., Washington, D. C., AWI-37, May 1943.

"Feed Consumption by Livestock 1910-41, Relations Between Feed, Livestock, and Food at the National Level," U. S. D. A., Washington, D. C., Cir. 670, R. D. Jennings.

"Minimum Prices Currently Supported by the Department of Agriculture and Related Information," U. S. D. A., Washington, D. C., June 1, 1943.

"Maximum Prices of Agricultural Commodities and Their Products," U. S. D. A., Washington, D. C., April 1943, Margaret F. Cannon.

"Using Resources to Meet Food Needs," U. S. D. A., Washington, D. C., May 1943, Raymond P. Christensen.

"Estimated Lags Between Farm, Wholesale, and Retail Prices for Selected Foods," U. S. D. A., Washington, D. C., June 1943, Herschel W. Little and Albert L. Meyers.

"Fruit and Vegetable Production and Consumption," U. S. D. A., Washington, D. C., July 1943, Alva H. Benton and Arnold R. Frank.

Pastures—That Come to Stay

(*From page* 10)

ing period of Persian. Hop clover, however, gives more and better grazing than either of the other clovers on sites where fertility and organic matter are low.

This combination of clovers, Dee said, apparently causes less bloating of cattle than stands of pure white clover, but he added that the growing of the three clovers together doesn't eliminate all danger of bloating.

With reference to the details of pasture development, Dee cited specific examples of successful pasture building.

On the Gill farm after oats were harvested from a 25-acre field in the spring of 1941, the land was disked in June and was seeded to 10 pounds of scarified crotalaria spectabilis seed and one bushel of cowpeas, mixed, per acre. These legumes were plowed under green in September, and 3,000 pounds of dolomitic limestone per acre were harrowed in. Following a rain, 200 pounds of 48 per cent phosphate per acre were applied and harrowed in. During the first week of November, 10 pounds of a mixture of white, hop, and Persian clover seed, in equal parts by count, and 10 pounds of Dallis grass seed per acre were sown. The following March, 100 pounds of 50 per cent muriate of potash were applied as a top-dressing. The pasture plants made exceptionally fine growth and carried three head of cattle per acre from February 15 through May 1942.

Gill was not as successful immediately with an earlier pasture development effort on 25 acres. This work was done before the services of a soil laboratory were available. Seeded in November 1940, the hop, white, and Persian clovers of this pasture began dying the next spring. The field had a reddish brown manganese color. Soil samples were taken and sent to the laboratory, and tests there disclosed that the land needed one ton of lime and 50 pounds of potash per acre in order to grow clovers. No additional phosphate was required. Gill already had applied 2,000 pounds of basic slag per acre, being unable at that time to obtain lime. On March 5, 1941, the farmer applied 200 pounds of 25 per cent potash per acre. Within 48 hours after this application, the field was green, and the loss of clover was stopped. In August, Gill disked the field with the disks set straight. Lime at the rate of 2,000 pounds per acre was applied behind the disk.

Pasture improvement doesn't end when the cows finally are turned in to graze. Good management and maintenance practices are required to keep grazing lands profitable year after year.

Weeds must be mowed. Otherwise they use moisture, food, and light needed by clovers and grasses. Mowing pastures, Dee explained, is as essential as cultivating crops of cotton or corn.

Rotation of livestock from pasture to pasture is extremely important. Three five-acre pastures will provide more and better forage production than one 20-acre pasture, in Dee's opinion. In fact, he has found that in many cases, three five-acre pastures will give twice as much grazing as one 20-acre pasture.

Fertilization and liming must be continued on the basis of actual needs of the clovers being grown. Each 1,000 pounds of milk produced from grazing a pasture removes 4 pounds of nitrogen, 1 pound of phosphorus, and 1¼ pounds of potash. Nitrogen, of course, is taken from the air by clover plants and stored in the soil, but phosphorus and potash must be applied.

For at least several years, potash will be required every spring in most pastures of the Florida Parishes. Lime will not be required except in rare

cases more often than once in 5 to 10 years, depending on the soil. Phosphorus must be applied every other year in the form of superphosphate or basic slag. This application should be made during the dormant season of the clovers—in August or September. The land should be double-disked with heavy weights on the disk and the disks set straight. Phosphate or basic slag then should be distributed.

All these figures of lime and fertilizers to be applied are estimates. Actual requirements should be determined by laboratory tests of soil samples. Dee said he believed that the average pasture can be maintained at a cost of $3.50 per acre per year for materials.

That cost is cheap in comparison with the value of these pastures to the dairy or beef cattle grower.

Louisiana's pasture development program seems destined to move much more rapidly in the future than it has even in the past few years. The State has millions of acres that should be kept under a permanent cover of vegetation to prevent ruin by soil erosion. Favorable prices for livestock and livestock products are added incentives for better pastures. Urgent need of meat and milk for workers and fighting men makes pasture building an act of patriotism. Technical assistance is now available in soil conservation districts that cover 16,507,000 Louisiana acres.

Support for the pasture development program is coming from many sources. Louisiana's Governor, Sam Houston Jones, recently granted the supervisors of the Bogue Chitto-Pearl River Soil Conservation District $20,000 of State funds to set up a plant for crushing sea shells with equipment made available to the district by the Soil Conservation Service. In this way, Florida Parishes farmers expect to obtain lime at a cost of about $2 per ton. In North Louisiana, through the efforts of the Governor, various agricultural agencies, and others, a deposit of limestone in Dugdemona Soil Conservation District will be crushed by a commercial plant.

Good pastures—meat- and milk-producing, money-making pastures—have come to Louisiana to stay.

Why Do Farmers Plow?

(*From page* 20)

This then is the picture of plant nutrition as we visualize nutrient elements coming from the soil. It is a chemical performance within the soil to which plowing and other similar mechanical measures contribute speed. The nutrient ions adsorbed on the clay move into the root in exchange for hydrogen ions coming from the plant root to take their place on the clay. The clay on becoming more extensively saturated with hydrogen ions—the active producers of soil acidity—passes them on to the silt and to other mineral soil particles as the means of weathering the nutrients out of these original rock forms. Thus, by means of plowing, the clay is rapidly reloaded with a stock of nutrients, or is buffered against what we have been viewing as dangerous, excessive acidity, but which is in reality dangerous soil fertility exhaustion.

As has been demonstrated by Dr. Carl E. Ferguson at the University of Missouri, this exhaustion of the clay's nutrient supply would occur in but a few crops were it not for the silt. It is through these steps, namely, rock to clay, clay to plant, that the nutrients pass. It is in the reverse direction, root to clay, and clay to mineral, that the weathering effects by the plants in the form of hydrogen as acidity travel for soil depletion of its mineral nutrient supply. Plowing increases both of these reciprocal movements of the chemical elements, and thereby facilitates what concerns most of us, namely, food production.

Fig. 7. Underprivileged animals go down with rickets when compelled to live on vegetation produced by soils exhausted of their fertility.

Plowing merely hastens many of the same processes that are occurring more slowly when "the land is resting." When land must be allowed to rest in order to boost its productivity back to economic levels again, this is merely proof that the fertility supply on the clay is exhausted so nearly to completion and the mineral reserve of fertility has fallen so low that the interactions between the clay and the minerals are too slow to move enough nutrients on to the clay surface to provide sufficiently for the roots during the growing season. Plowing isn't the cause of the depletion of the fertility supply. Depletion occurs because of the fertility removed within the crop hauled off. The plow is not the exploiter; rather, it is the farmer. The plow is merely the tool that facilitates his exploitation at a faster rate and over more acres than before the plow was given him. The plow has helped him to feed many of us too far removed from the land to appreciate its exploitation.

Some of our plains have been exploited to such an extent that even the plow can't substitute for the time needed to restock the clay from the mineral reserve. These soil processes are too slow in rate, and too limited in amounts of fertility mobilized thereby, to finish, for example, one wheat crop in June and to germinate to a good start another crop by the succeeding October, even with the help of plowing. This is the case of a plot on Sanborn Field in Missouri, where wheat has been seeded annually without fertility restoration since 1888. This plot is now taking an annual rest on its own accord after it produces one crop. It has become a yielder only in alternate years. This is because the soil fertility delivery processes that are moving nutrients from the soil minerals to the clay and from there to the roots in exchange for hydrogen going in the opposite direction are too slow to give ample supplies unless an extra year elapses. Fertility and not water are concerned. Surely, such a biennial performance with regularity over almost 25 years is not a case in which "the soil simply takes time out from its business of growing things until the restoration of its normal water supply." Food more than water is involved.

Here is a suggestion that any accusation of the plow as a responsible agent for soil deterioration is a misplaced and unfair condemnation. Such accusation would still seem just, even if by the best of science we should lay bare every principle of only physics that plowing of soil involves. Even if we should dispel the belief that "the exact physical effects that follow the operation of the plow have never been subjected to scientific scrutiny," the plow might still be listed for its exit as an implement. Plant production is more than applied physics and particular mechanics. It is a matter of delivery of the required plant nutrients. The soil processes providing nourishment within the soil are slowing down because of soil fertility exhaustion more than through bad mechanics premised on "what we learned in elementary physics in high school."

Shifts in the kinds of nurse crops and in the kinds of legumes in order that we might accept substitute crops are very striking evidence of soil ex-

hausted of its nutrient reserves. Not only is the slowing down reflected in grain crops by their alternation between a crop and a crop failure, older apple trees become alternate-bearers. Older cows pastured on and fed products from many soils of declining fertility go on similar biennial schedules in reproduction. Surely the plow isn't to be blamed for what happens in the subsoil under the apple trees or for nutritional irregularities on permanent sod pastures that come to light in terms of breeding troubles in cattle.

If we are to bring the plow into this picture of "the debacle into which our American soils have drifted," the case could not be rested on the contention that while the farmer's "reputation for smoothness and neatness of the plowed field was developing, no thought was given to the possible connection between smoothness of the land surface and exclusion of the rainwater from the soil." Antediluvian ideas about water in the soil, about the wet subsoils under freshly incorporated green manure interpreted as interrupted capillary rise rather than "sweat" from the respiring and decaying organic matter—to say nothing of many other ideas almost equally hoary—don't convict the plow except for those unfamiliar with more recent soil science. Plowing and crop production are more than water problems. No one will deny that even these are serious enough. Declining soil supplies of fertility are making the water problem worse as we allow the plants to starve for nutrients while they are wasting their water transpiration and carrying on within themselves little or no construction of the organic, nutritional complexes they are intended to synthesize. Water will be the lesser of the soil troubles when we understand nutrition, and when we feed the plant so that what water we have will be used most effectively for crop production.

Starving plants do more damage than merely that of wasting water. They invite attacks by bacteria and fungi to cause much that is regularly called "plant disease." Starving plants are symptoms of soils that are no longer stable in their desirable structural conditions known as granulation. Their surfaces are hammered flat with the first dash of rain and are moved off in deflocculated condition as erosion in the balance of the rain. To the eye and mind that are observing soil fertility, numerous other plant and soil symptoms are clearly visible. For such an observer the real debacle about agriculture is that we continue to exploit our soil resources without giving the slightest thought to the fact that these unrecognized and unappreciated chemical changes within the soil are basic to erosion, to disturbed agricultural economics, to distorted national economy, and to a disturbed national health, as draftee rejection figures reveal.

Shift Demands Plowing

This larger problem is aggravated by the plow, but also by any tool, either mechanical or psychological, that encourages and permits continued exploitation of the fertility of the soil in the same manner as we mine and consume many other resources. The land is the basis for our existence by way of the food it provides for use. The mining performance of it has brought us to where it is difficult to change and to shift into using the soil only as a site for soil fertility "turnover" by putting in about as much of plant nutrients as we take out in crops.

This shift to letting land rest, to putting out the land to grow cover, to encouraging organic matter restoration, to purchasing fertilizers as a definite program of returning almost the ash equivalent of the crop removal demands more than that the farmer quit plowing. This shift to squeezing out the charges assessed against an unearned increment, and to going back to an acre value of the soil as a producer after deducting costs of fertility maintenance, labor, and investment carriage even at the low rate acceptable to the man of the soil whose hope for security is still pinned to the land, is a change

that calls for more than invention of a scapegoat in the form of the plow.

The understanding of the processes in the soil as a producer of our foods has become a challenge to an increasing number of people. Friends of the land are multiplying so that with a knowledge about and deep concern for the soil, they will not long leave unanswered the question, Why Plow?

Do Farmers Naturally Adjust Their Crops?

(*From page* 22)

reduced their acreage of tobacco 10 per cent in 30 years, on an average, but they have yields that are 37 per cent greater so the total production is about 20 per cent larger than it was then.

The total quantity of fertilizer used on both types of farms has remained about the same, but it has been applied to smaller acreages.

In all, technical studies have been made of the changes in organization and income through 30 years of about 17 farm types that are typical of the important farming groups in the corn, cotton, dairy, tobacco, and wheat areas. The briefed results are available to those who want them. While making these analyses, farmers' production possibilities are learned type by type, and the stresses and strains on the agricultural plant are assessed. Then the analyses permit the appraisal of changes that affect important farming groups and the appraisal of their impact on the organization of individual farms and the welfare of their owners.

Tobacco Demands Best Fertilizer

(*From page* 26)

The tobacco grower, knowing the general fertility of his soil, his cropping practices, and how much fertilizer was applied to previous crops, is in the best position to know how much fertilizer he should use per acre. The experts can only make general recommendations.

Under normal conditions, they say that 800 to 1,200 pounds of a 3-8-6 tobacco fertilizer give satisfactory results on light or less productive soils. On the heavier or more productive soils, they recommend from 800 to 1,000 pounds of a 3-10-6. On some soils in the Piedmont section, they say that it is often advisable to use 800 to 1,000 pounds of a 2-10-6 fertilizer. This analysis is also recommended in other sections where tobacco follows a legume crop with heavy growth.

During the past season, with the restricted number of grades of tobacco fertilizers, the principal ones used were 3-8-5, 2-10-6, 3-9-6, 3-9-9, and 2-12-6. There were some tobacco top-dressers on the market, but in many sections growers could not obtain sulphate of potash and sulphate of potash-magnesia for top-dressing because these materials were required in making complete fertilizers.

The most essential plant-food elements considered in fertilizers for producing tobacco are nitrogen, phosphorus, potassium, calcium, magnesium, chlorine, and sulphur. All of these elements and others normally supplied in adequate amounts by the soil have important functions to perform in feeding the tobacco plant, and fertilizer manufacturers are careful to follow the results of research and experimental work in building a well-balanced fertilizer.

One of the plant-food deficiencies most often encountered in the field is potash hunger. The tobacco plant exhibits strikingly characteristic effects when sufficient potash is not supplied. The lower leaves of the plant show a

typical mottling or lack of color at their tips. This condition spreads along the margin of the leaf and, if potash hunger is severe, there is a speckling of the leaf, usually in the center of the mottled tissue. Certain leaf-spot diseases gain entrance into the leaf tissues and hasten their breakdown.

It is a well-known fact that potash, in some manner, aids in maintaining the general vigor of the tobacco plant. Liberal supplies of potash enable the plant to withstand or ward off attacks of the leaf-spot diseases caused by bacteria. The agronomists report that there appears to be a luxury consumption of potash required for tobacco leaf of high quality, and the greater the amount of potash supplied the plant, the greater will be the amount of potash found in the leaf.

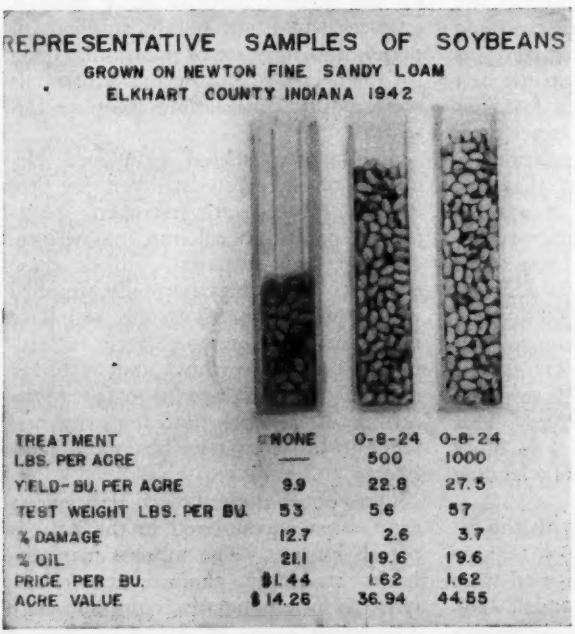
Magnesium deficiency, commonly called sand drown, rarely appears in the field until after the plants have been topped. When there is a shortage of magnesium, the lower leaves of the plant lose their normal green color at the tips, then along the margins, and finally between the veins, which remain green. In extreme cases, the leaves turn almost white, but rarely do they dry up and show the necrotic spots characteristic of potash hunger.

Magnesium hunger is more prevalent on deep, sandy soils and during periods of excessive rainfall. On the other hand, potash hunger is most pronounced during dry periods.

Since tobacco is such a responsive crop, the experts must be on their guard with the shifting of materials available for producing tobacco fertilizers. Representatives of the experiment stations and the extension services in the various states growing tobacco carefully study the results of all the fertilizer tests made on tobacco and then make their recommendations for the coming year.

More Soybeans, Please

(*From page* 25)


REPRESENTATIVE SAMPLES OF SOYBEANS
GROWN ON NEWTON FINE SANDY LOAM
ELKHART COUNTY INDIANA 1942
TREATMENT NONE 0-8-24 0-8-24
LBS. PER ACRE — 500 1000
YIELD-BU. PER ACRE 9.9 22.8 27.5
TEST WEIGHT LBS. PER BU. 53 56 57
% DAMAGE 12.7 2.6 3.7
% OIL 21.1 19.6 19.6
PRICE PER BU. $1.44 1.62 1.62
ACRE VALUE $14.26 36.94 44.55

Fertilizer plowed under made the big difference.

acre. This was on a potash-deficient, black, sandy soil in White county.

The potash-starved beans did not mature naturally. The leaves started to die before the beans were completely developed, the test weight was lowered, and the percentage of damaged beans was usually high. The soybeans on the potash-deficient soil were so much shorter at harvest time that they appeared to have stiffer stems than the taller, better podded, well-fertilized beans.

Visitors who saw these demonstration plots early in the season

were impressed by the more thrifty appearance of the fertilized soybeans. The differences were so great in some instances that the effect could be seen at a distance of 10 rods.

Indiana's war-time fertilizer recommendations for soybean production include:

Lime all very acid soils at the rate needed for red clover.

Where soybeans are drilled in rows for cultivation, apply with a divider fertilizer attachment up to 150 pounds per acre of the phosphate-potash mixture recommended for corn, usually an 0-20-20, or 0-12-12.

On soils low in productivity, plow under 300 to 500 pounds of the above phosphate-potash mixture recommended for corn. On potash-deficient soils, use the 0-9-27 mixture at the rate of 500 pounds per acre.

Potash for Citrus Crops in California

(*From page* 14)

On the Wohlford Valencia grove at Escondido, blocks of 48 trees with and without potash applications were studied. The potash was applied at the rate of 10 pounds sulphate of potash per tree, starting in 1939.

In 1940 and 1941, the field-box record was the same on each block of trees, but the record of packed boxes of Sunkist grade showed an increase in favor of the potash treatment of 15 boxes per acre in 1940 and 30 boxes per acre in 1941.

In 1942, a difference in yield of field boxes showed up, amounting to 66 more boxes per acre on the potash plot. Grading records showed in addition that the potash treatment resulted in 61 more packed boxes of Sunkist grade per acre than the check trees.

Average leaf analysis for the years 1941-42 shows that the potash-treated trees have 24 per cent more potash in the leaves than the check trees.

Test plots established on the Cunningham navel orange grove at El Cajon in 1939 showed no difference in yield until the 1942-43 season. However, during this period the potash block did show about a six per cent increase in packed boxes of Sunkist grade fruit.

In the 1942-43 crop, a large difference was obtained in the record of yields and grades from the two blocks. The potash-treated trees yielded 12.42 field boxes per tree and the check plot 10.60 field boxes per tree. Packed box records showed the following:

	Potash	Check
Sunkist packed boxes per tree	3.44	1.96
Red Ball packed boxes per tree	2.29	1.91
Total packed	6.73	3.87
Standards per tree	2.10	2.71
Discards, culls, etc., per tree	0.94	0.79
Per cent of field boxes picked packed as		
Sunkist	27.74	18.51
Red Ball	18.46	18.31
Total per cent packed	46.20	36.82

The content of potassium in the leaves from these plots averaged for the years 1941-42 reveals that the potash-treated trees have 21 per cent more potassium in the leaves than the check trees.

Because of the interest which might attach to a study of quality factors closely related to those commonly considered in the commercial grading of citrus fruit, many thousands of measurements have been made on the fruit from the various test plots since 1938.

Lemons at Lemon Grove, California, showing poor tree condition. Leaf analysis has shown a low content of potash in the leaves.

These measurements taken on both potash and check plots were:

1. Comparative weight of 1,000 fruits of same ring size.

2. Comparative rind thickness measured at the stem end and side of 100 fruits of same ring size.

3. Comparative juice volume in duplicate samples of 100 fruits of same ring size.

Out of a total of 76 such tests 60 have shown more juice in the fruits from the potash plots. Heavier fruits were measured on the potash plots in 50 out of the 76 tests. A thinner rind was measured on the potash plots in 53 out of the 76 tests.

As a result of these measurements, it is reasonable to conclude that the potash treatments have caused a definite trend toward greater juice volume, heavier fruits, and a thinner rind in two-thirds of the number of tests.

Due to the extremely varied chemical and physical make-up of the soils upon which citrus crops are planted, it is only reasonable to expect that cases will be found where applications of potash are not necessary. This was the case in a number of the test plots, where the trees were already being adequately supplied by the soil. In other cases where the trees failed to respond to potash, there were other factors which needed correction before a potash response could be expected. In a few cases, potash test plots were carried on for only two or three years and then discontinued because it appeared that no response was being obtained. We know now that this was a mistake, since it may take several years on some soils for the potash to exert its full effect, after which marked differences can be measured on the potash-treated trees.

The outcome of these test plots thus far points to the fact that potash may be quite profitably used in the fertilizer programs on a number of the groves under test. It also emphasizes the desirability of re-appraising the need for potash in southern California citrus groves, heretofore considered by many as relatively unimportant. In this reappraisal, the use of heavier-than-usual amounts of potash applied in furrows, combined with carefully measured results over a period of years, promises to revise some of our former conceptions as to the ability of citrus trees to obtain an optimum amount of potash under all of our soil conditions.

Post-War Prophets

(*From page* 5)

Probably the least we say on this touchy topic the better, owing to the ruckus it stirs up on both sides. Our chief hope lies in American common sense and decency, plus the prime necessity of cleaning up things at home before we start arbitrating other folks' squabbles and selfishness.

MY OWN small private thought on this deal is that, bereft of professional political stirrers-upper and barnstorming leaders, our agricultural-industrial relations would more or less smooth themselves out. Both monkey-wrenches and pitchforks are useful tools when used rightly by experts, but too many ambitious guys have diverted them for throwing and lunging purposes.

Maybe the experience of sons in factories will help our farmers to see things better, as likewise the victory garden clubs have shed some light on urban minds as to the things it takes to raise food. Yes, I favor appointing such a committee all right, with plenty of home-cooking and police protection.

Pride of profession, of religion, and of race must all be ironed out in a domestic way so as to keep all morons and misfits from ruining our democratic unity.

Yet, farmers retain enough pride in their own profession to sense that the post-war era must rid agriculture of a few obstacles and conflicts which may be said to originate in the ranks of farming itself and be capable only of improvement from within.

"Take the way the farm program has branched out and become so complex and almost bewildering as to confuse the producers themselves, let alone outsiders," remarks an old line committeeman of the AAA.

"Ten years ago we had one agricultural office at the county-seat town, located down in the basement two doors from the poor commissioner and opposite the men's lavatory. Here the county agent met his cronies and handed out circulars. A few breed clubs held sessions there, and 4-H clubs cluttered up the premises with regalia and demonstration material.

"But now a farmer who seeks advice, credit, soil-erosion assistance, or market help must wander around town looking for various metal signs issued by a multitude of federal agencies; and after stumbling into the wrong pew half a dozen times, he may locate the right spot before his wife begins hunting for him to take her home.

"Extension information is carried on by three or four agencies working independently, stemming from grand headquarters, regional headquarters, and state headquarters. What we need is a general assembly of all those divers departments and fieldmen into one main circus, and then cut out some of the state and regional directives with their overhead and underbrains."

Probably he has hit on a sore spot that can stand some intelligent post-war planning. It is doubtful if we can reach an amicable settlement much before that time. If we can keep some of the agencies from belittling each other awhile, we shall have paved the way for compromise.

"AND while I am at it," continued the aforesaid committeeman, "it strikes me that we also need a solid and permanent footing for our post-war farm programs; not just messy patchwork strung together haphazard. Flexibility is advisable, but not at the risk of stability.

"Another thing, I do not think our farmers will ever willingly kid themselves again into any nation-wide scheme to arbitrarily reduce production or to make gestures in that direction, while exerting themselves as usual for

bigger yields and more units of net output.

"If this great country of ours can gear itself to a huge productive effort to create forces and methods for destruction and warfare, why in tarnation must we always be going into tail-spins of unemployment and low demand during decent spells of peace?"

I think this thought is behind most of the farm folks I have talked with lately. They don't care whether the creative force or driving purpose comes from the government or from commerce and industry, so long as it is possible to make work as attractive and remunerative and capital as eager to expand in a post-war world as it has been in a war-ridden nightmare. Farmers can't solve this themselves, but they'll be right on the side-lines rooting for the men who carry the ball between the goal posts for a victory over old fears and phobias.

VOICES are also heard asking that attention be paid after the war to a project for cleaning up rural as well as city slums. No doubt, vast and sensible public works systems might be put in motion to widen and beautify the main and branch highways, improve recreation spots, encourage home adornment, and even force landlords—able to do so—to give tenants a break in respect to home and household environment.

Likewise, many a rural village has fallen into sad decay, and cannot hope to serve as an inspiration or a challenge to surrounding farm youth. Here also lies a primary field for human ambition and enterprise.

Something must be done to clear the title of the young farm lad who works and strives as his parents' last helper, only to find the estate cut to pieces and divided upon sale to half a dozen relatives who quit farming many years before. This calls for a unified pattern of legal settlement and security, especially in view of the return of war veterans whose presence on the old homesteads will be highly welcome.

After all, the happiness of sound rural living is not something that can be bargained for through any commercial system of agriculture. It's little things that go to make up post-war delights, little things that ordinary humans can do for themselves without recourse to bureaus or congress. Often small ideas set going in some isolated place take hold of wider imaginations and sweep abroad into national currents of change and improvement.

As one lonely farm wife expresses it—"Do farm houses have to be so isolated?" I have in mind what I call my pie-shaped Utopia. In such a happy community the farm houses would all be clustered together around the church, the school, store, library, movie, and public hall with their barns just behind them, and their fields stretching back like wedges. Houses would be wired for electricity and have running water.

"It might make the fields look queer, but this would be offset by the joy of leaning over the fence to gossip while the washing machine is running, of seeing the children safely across the road to school instead of sending them on a long, three-mile walk, of going to church every Sunday, and social games of cards and neighborly evenings.

"This may sound like borrowing from decadent Europe to rebuild rural America, but it would suit plenty of us lonesome farm women. And the materials to equip and design plenty of rural houses can be had cheap, when the army camps and drill grounds are dismantled for peace."

NOT any more weird and unworkable maybe than a number of queer post-war proposals that have been given the official right of way. Anyhow, it proves my contention that the farm folks are dreaming hard, and hoping intently. That's all to the good, for unless we get recipes for worldly comfort and security from the same ones who furnished the courage and the taxes, our post-war plans may simply be another pre-war instigator.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Potash Pays on Grain (South)
Greater Profits from Cotton
Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Grow More Corn (South)
Fertilizing Small Fruits (Pacific Coast)
Potash Hungry Fruit Trees (Pacific Coast)
Fertilize Potatoes for Quality and Profits (Pacific Coast)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (General)
Fertilize Pastures for Better Livestock (Pacific Coast)
What You Sow This Fall (Canada)
Home-grown Grains for Profitable Hogs (Canada)
What About Clover? (Canada)
Of Course I'm Interested (Pastures, Canada)
Meet the Family (Canada)

Reprints

T-8 A Balanced Fertilizer for Bright Tobacco
CC-8 How I Control Black-spot
II-8 Balanced Fertilizers Make Fine Oranges
N-9 Problems of Feeding Cigarleaf Tobacco
T-9 Fertilizing Potatoes in New England
DD-9 Some Fundamentals of Soil Management
KK-9 Florida Studies Celery Plant-food Needs
MM-9 Fertilizing Tomatoes in Virginia
UU-9 Oregon Beets and Celery Need Boron
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
J-4-40 Potash Helps Cotton Resist Wilt, Rust, and Drought
S-5-40 What Is the Matter with Your Soil?
CC-10-40 Building Better Soils
A-1-41 Better Pastures in North Alabama
E-2-41 Use Boron and Potash for Better Alfalfa
I-3-41 Soil and Plant-tissue Tests as Aids in Determining Fertilizer Needs
K-4-41 The Nutrition of Muck Crops
U-8-41 The Effect of Borax on Spinach and Sugar Beets
Z-9-41 Grassland Farming in New England
BB-11-41 Why Soybeans Should Be Fertilized
EE-11-41 Cane Fruit Responds to High Potash
HH-12-41 Some Newer Ideas on Orchard Fertility
II-12-41 Plant Symptoms Show Need for Potash
B-1-42 Growing Ladino Clover in the Northeast
D-2-42 Boron Deficiency on Long Island
E-2-42 Fertilizing for More and Better Vegetables
F-2-42 Prune Trees Need Plenty of Potash
G-3-42 More Legumes for Ontario Mean More Cheese for Britain
H-3-42 Legumes Are Essential to Sound Agriculture
I-3-42 High-grade Fertilizers Are More Profitable
O-5-42 Nutritional Information from Plant Tissue Tests
P-5-42 Purpose and Function of Soil Tests
Q-5-42 Potash Extends the Life of Clover Stands
R-5-42 Legumes Will Furnish Needed Nitrogen
S-6-42 A Comparison of Boron Deficiency Symptoms and Potash Leafhopper Injury on Alfalfa
T-6-42 The Fertilization of Pastures and Legumes
X-8-42 Conserve Nitrogen Now
Y-8-42 The Southeast Can Grow Clover and Alfalfa
Z-8-42 The One-Mule Farmer Needs a New Machine
AA-10-42 Growing Legumes for Nitrogen
BB-10-42 Insuring Success With Indiana Sweets
CC-10-42 Managing Mucks Includes Control of Blowing
DD-10-42 Clover Pastures for the Coastal Plains
EE-11-42 Lespedeza Pastures for Florida
FF-11-42 Boron in Agriculture
GG-11-42 Some Experiences in Applying Fertilizer
HH-11-42 The Nutrition of the Corn Plant
II-12-42 Wartime Contribution of the American Potash Industry
JJ-12-42 The Place of Boron in Growing Truck
A-1-43 The Salt That Nearly Lost a War
B-1-43 Crotalaria—A Crop That Grows Like Weeds
C-1-43 Quality in Grasses for Pasture and Hay
D-1-43 For Hershey Orchards—Complete Fertilizer
E-1-43 Borax for Alfalfa in Tennessee
F-1-43 Boron Improves Canning Beets
G-1-43 Plow-Sole Fertilizers Make Good Showing
H-2-43 Plant Food for Peach Profits
I-2-43 Building Terraces With Slip Scrapes
J-2-43 Maintaining Fertility When Growing Peanuts
K-2-43 Feeding Minerals By Way of the Soil
L-2-43 Victory Gardeners Produce & Preserve
M-3-43 Lespedeza Is Not A Poor Land Crop
N-3-43 Boron and Potash for Alfalfa in the Northeast
O-3-43 Indirect Nitrogen Fertilization
P-3-43 Ohio Farmers Try Plow-Under Fertilizers
Q-3-43 Winning the Battle for the Land
R-3-43 More Smokes Per Acre
S-4-43 Plow-Sole Fertilizers Benefit Tomatoes
T-4-43 Fertilizing Tung Trees by Leaf Analysis
U-4-43 Potassium-Boron Relations in Plants
V-4-43 Permanent Pastures Need Help
W-4-43 The Soil Is the Basis of Farming Business
X-5-43 Malnutrition Symptoms & Plant Tissue Tests of Vegetable Crops
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
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THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON 6, D. C.

Gob: "May I kiss you? May I please kiss you? Say are you deaf?"

She: "No. Are you paralyzed?"—*U.S.S. Wichita Sun Dial.*

ORDERS

To his Negro company of infantry in camp a black first sergeant spoke dire words: "From now on when Ah blows dis yere whistle, Ah wants to see a huge impenetrable cloud of dust come boilin' outa dem tents. An' when 'at dust clears away, Ah wants to find two rows of statues."

Fanny was thoroughly angry at her swimming teacher.

"The fresh thing," she exclaimed. "After I won the race, he came to me and said, 'My dear, you kept your end up magnificently'."

"You should buy an encyclopedia now that your little boy is going to school."

"Not on your life. Let him walk, like I did."

"Does your father keep the Ten Commandments?"

"I'm not sure, but I think it's all he can do to keep up with the rationing regulations."

Voice from rear seat of taxi: "I say, driver, what's the idea of stopping?"

Driver: "I thought I heard someone tell me to."

Rear seat: "Drive on. She wasn't talking to you."

HOME GROWN

"How has your potato crop turned out?" asked a Victory gardener of his inexperienced neighbor.

"Fine, fine! Some are as big as marbles, some as big as peas, and, of course, we had quite a lot of little ones."

"Smith is getting married next month, and we are going to give the bride a shower."

"Count me in. I'll bring a towel."—*U.S.S. Phoenix Flame.*

Caller: "May I speak to the lady of the house, please?"

Maid: "There ain't no lady of the house any more, she's a lieutenant."

NO NOVELTY TO HIM

The men had been going over the usual obstacle course—swimming across a pool of dirty water, running up a bank, climbing a seven-foot wall, scrambling through bushes and barbed wire, and finally climbing a mountain.

The colonel shouted to one of the lads as he came to the end of this jaunt:

"How do you like it, soldier?"

"Where I come from, sir, we have to go through country like this just to get to the barn."

Seaman Sam says: "Many girls find life a ticklish proposition."—*U.S.S. Cushing Clarion.*

Most women's feet are a lot bigger than they look.

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Potash from Soil to Plant
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New Soils from Old
Potash Production in America

We shall be pleased to loan any of these films to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible) and period of time of loan.

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POTASH IN NORTH AMERICA

By J. W. TURRENTINE

President American Potash Institute

AMERICAN CHEMICAL SOCIETY MONOGRAPH NO. 91

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AMONG American chemical industries that have attracted national and international attention due to their war-emergency performance, few have exceeded the American potash industry.

This interesting and well-written survey of the development of the American potash industry during the last fifteen years is particularly important at the present time, when the food problem is second in importance only to the war itself. After a brief review of the present sources of potash, complete details are given as to production, both domestic and foreign; present status of the industry; and its future prospects. Special attention is accorded to Carlsbad, N. M., and Searles Lake, Calif., developments, and to the fundamental technology of potash. This important volume has been made unusually attractive by the inclusion of a large number of exceptionally good photographs of all phases of the industry.

Dr. Turrentine, of the American Potash Institute, is one of the country's leading authorities in this field. His work will be welcomed as a most significant addition to the literature of the subject by all who are interested in any way in the production and use of potash and related products. This book will be required by public libraries, as it is the only source of reliable information on the current status of this vital resource.

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CHAPTERS

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